Railway Age

DAILY EDITION

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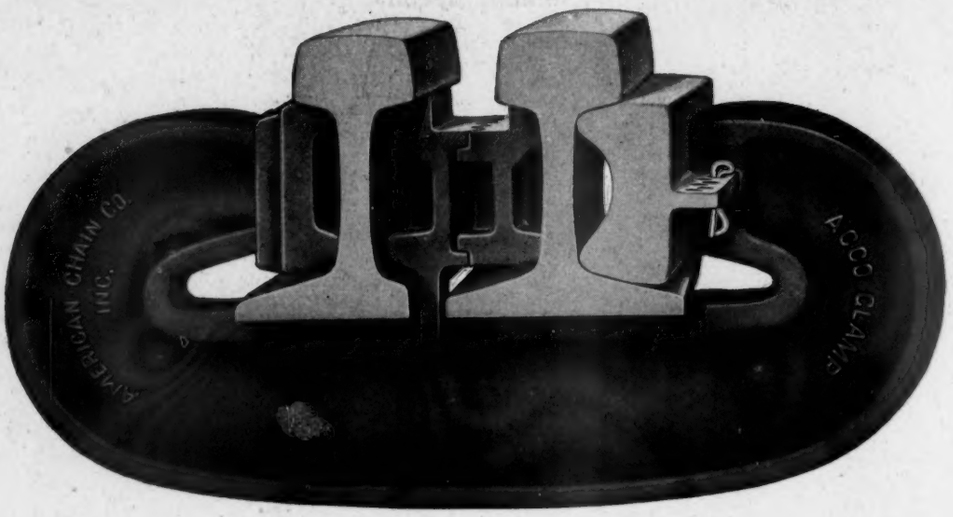

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Railway Age

EDITORIAL

DAILY EDITION

Contents

The Signal Section Attendance

The attendance at the March stated meeting of the Signal section yesterday was much heavier than was anticipated two or three weeks ago. At that time there was a feeling that the meetings of the signal section and also of the American Railway Engineering Association would suffer in attendance because the Interstate Commerce Commission had set March 15 as the latest date on which the railroads cited in its proposed train control order could show cause why the order should not be made effective, and it was expected that the officers attending these meetings would have to be in Washington for the hearing. When the commission extended the date until March 20, this fear was removed and a large turnout resulted.

A Guide For Interlocking Wiring

The electric wiring of interlocking plants has been done in widely different ways on various railroads. Therefore, the Committee on Power Interlocking is to be commended for the preparation of specifications for this work. The diversity of construction is indicated by the recent recommendations of three roads interested in a certain interlocking reconstruction. One road recommended underground cables in conduit, another preferred trunking on top of the ground as cheaper, while the third road wanted a combination of trunking and cables placed on cable posts. A certain road is now trying paper-insulated, lead-covered cables for control circuits at power interlockings, while recent information from Australia, where this construction is used extensively, indicates that it is not considered a success. This committee has an opportunity to point out possible economies to the railroads and the new specifications may be considered as an excellent foundation for the wiring of interlockers.

New Committee on Highway Crossing Protection

The new committee on Highway Crossing Protection appointed at the meeting of the Signal section last June has an opportunity to save the railroads large sums of money and prevent extensive loss of life. The report of the Interstate Commerce Commission covering railroad accidents in 1920 states that 1,790 persons were killed at highway grade crossings as compared with 584 persons killed in all collisions, derailments and locomotive accidents. The installation and maintenance of automatic highway crossing bells, wig-wags and similar devices have been handled by the signal departments of the railroads for years. Therefore, it would seem that this new committee will fill a long-felt want in the ranks of the committees of the Signal section. The committee has done well to co-operate at once with the Committee on the Prevention of Accidents at Highway Grade Crossings and Trespassing of the A. R. A., adopting its standard signs for use for fixed approach warning signs. It has also produced a specification for the banner to be used on automatic movable highway crossing signals. The committee has made a good start and railroad officers concerned should give it full assistance.

The Committee on Conservation

Members who have attended conventions regularly during the last ten years will note the absence this year of any report by the Committee on Conservation of Natural Resources. This committee went out of existence with the presentation of its report at the last convention, it being the decision of the directors that the purpose for which the committee was organized had been fulfilled. This committee was created in 1910 in conformity with a growing appreciation on the part of the American people of the value of their natural resources, thanks to the impetus given this movement by the late President Roosevelt. Just what part the railroads could play in this scheme for natural conservation was, of course, problematical. In fact, it may be said that the answering of this question was the prime responsibility with which this committee was charged upon its formation. With each succeeding report of the committee at the annual conventions there came a general realization that conservation in so far as it concerned the railroads implied the practice of simple economy in the use of all things required for the construction and operation of the railroads. Obviously, this is not the responsibility of one committee, but of all those having anything to do with the business of running a railroad; for as each member of the association

should remember, the word "economic" occupies an important place in paragraph II of the constitution, which states the object for which the association was organized.

A Good Time to Start Work

MANY INDICATIONS POINT TO THE present as the most suitable time for carrying out construction work since before the world war. As an example of the present trend of developments, slightly more than a month ago a consulting engineer representing a certain city and two large railroads requested proposals for the construction of a 1,500-ft. reinforced concrete viaduct over 23 tracks in the municipality in question. He had, at the completion of preliminary plans last year, estimated the cost of this project at $220,000. Three weeks ago, however, he revised his former estimates to conform to the changed conditions in the labor and material markets, and informed his clients that the cost of the structure at this time should not exceed $140,000. When 20 bids were opened on the first of this month he was surprised to find an array of figures ranging from $92,732.50 to $211,000, with the low bidder claiming that he was quoting at practically pre-war prices. There has been a notable reduction in the cost of many materials. Then labor conditions generally have improved in most localities. But the one great factor contributing to the lowering of the high cost of construction has been the prevailing "cutthroat" competition among contractors, many of whom now bid for work at cost in order to maintain their organizations. In fact, the writer was recently informed by one contractor that exactly $7.50 was made on the construction of a depot 1,000 miles from his headquarters, this sum to be divided among his partners and the overhead expense of an office force. Work has been scarce and the railroads have been flooded with requests for opportunities to bid on even small jobs. Why should not the roads take advantage of the present opportunity to start some of their long-deferred work, especially since it is the general belief that prices of materials will again rise and a few months will see an end of low bidding?

Reasons for Optimism

IN VIEW OF THE ALMOST entire absence of construction activities on the part of the railways during the last two or three years, the statement of an engineer of over 40 years' experience on one of the leading roads of the country a few days ago, that although he had seen many declines and recoveries in railway construction, he had never regarded the future as optimistically as at present, is refreshing and encouraging to the members of the engineering association as they gather for their convention. To one who recalls the activities of 1905 and 1906 with their widespread programs of extension and improvement work and who contrasts this condition with that of the more recent past, a feeling of credulity is excusable. However, there are now more developments in support of the statement referred to above than is generally realized. Even more encouraging is the common understanding that the work authorized is only the forerunner of even larger programs which are advancing to the point of actual inauguration. There is much justification for the opinion that by the middle of the summer we shall be in the midst of an active construction season. Solely with the purpose of pointing out a few of the projects that already have been announced and without any attempt at completeness, we will refer to some of the work which has been definitely authorized in recent weeks.

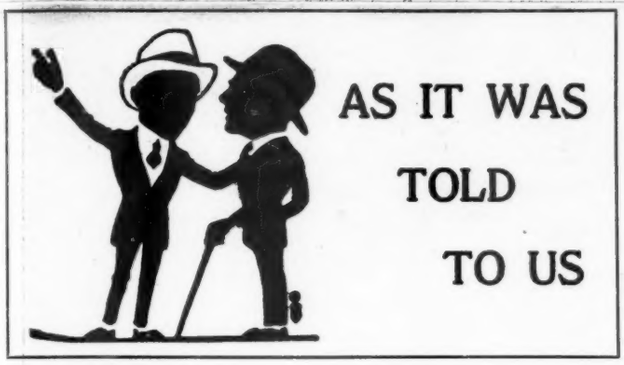
In view of the almost complete cessation of work on extensions, it is significant that public announcement has already been made of the intention to construct over 500 miles of new lines this year and contracts have already been let for at least half of this mileage. Among the projects already authorized are an extension of 55 miles on the Atchison, Topeka & Santa Fe from Satanta, Kan., west, and a line 40 miles long from Pawhuska, Okla., to Owen, which are understood to be the first of several projects which this road has in contemplation. The Dallas-Terrell, a Texas road, has awarded a contract for the construction of 34 miles of line; the Portland, Astoria & Eastern is now building a 32-mile extension at a cost of $2,600,000; the Chicago, Milwaukee & Gary (Chicago, Milwaukee & St. Paul) will build 29 miles of line between Joliet and Gary at a cost of $2,700,000; the Minarets & Western has let a contract for 55 miles of new line to cost $2,500,000; the Kansas & Oklahoma Southern has been authorized by the Interstate Commerce Commission to build 71 miles and the New Holland, Higginsport & Mount Vernon has received permission from the same source to build 35 miles of line.

With reference to second track, the Santa Fe has announced that it will reduce grades and provide an additional track between Yampai, Ariz., and Griffith, 75 miles; the Great Northern will build 47 miles of second track in Washington and elsewhere; the St. Louis-San Francisco has awarded contracts for 20 miles; the Chicago & Alton has started work on 11 miles north of Alton, Ill., which is estimated to cost $362,000, and the Illinois Central has appropriated $2,000,000 for the construction of a third track, the reduction of grades and other improvements between Matteson, Ill., and Kankakee.

In so far as terminal facilities are concerned, the Pere Marquette has appropriated $1,400,000 for the construction of locomotive shops at Grand Rapids, Mich.; the Missouri, Kansas & Texas has awarded contracts for the construction of a new gravity classification yard and shops at Denison, Tex., at an estimated cost of $3,000,000; the Santa Fe has undertaken the construction of additions to its shops at San Bernardino, Cal., estimated to cost $224,000; the Erie has awarded a contract for a large pier on the Hudson river at Weehawken, N. J., and the Canadian Pacific has announced its intention of proceeding with the construction of a large ocean terminal on Burrard Inlet, Vancouver.

Among miscellaneous projects may be noted the Canadian Pacific's addition to its Hotel Chateau Frontenac, Quebec, for which $3,500,000 has been appropriated; the Santa Fe's enlargement of its Alvarado hotel at Albuquerque, which is estimated to cost $300,000, and a new icing station for the Belt Railway of Chicago, which it has announced will cost $350,000. The New York Central has awarded a contract for the elimination of grades through North Tonawanda, N. Y., at an estimated cost of $500,000; the Illinois Central is working on plans for the immediate reconstruction of its bridge across the Ohio river at Cairo, for which $8,500,000 has been set aside, while the New York Central has advertised for bids for the construction of a high bridge over the Hudson river below Albany, N. Y. The Delaware, Lackawanna & Western has requested manufacturers to furnish estimates of the cost of electrifying its lines near Scranton, Pa., which will cost about $5,000,000.

In this summary no attempt has been made to present a complete list of the larger projects which have been authorized or those which are in contemplation but concerning which no specific announcement has yet been made, or to include the many smaller projects, such as stations, yard extensions, coaling stations, water treating plants, etc. The list enumerated is, however, sufficient to demonstrate conclusively that the railways are viewing the future with more optimism and are availing themselves of the first opportunity to improve and expand their facilities in a manner which will enable them to cope with the next surge in traffic.



C. H. Niemeyer, acting engineer maintenance of way of the Central Pennsylvania division of the Eastern Region of the Pennsylvania, with headquarters at Williamsport, Pa., died on March 4 from an attack of appendicitis.

* * *

The annual meeting of the National Railway Appliances Association will be held in the restaurant of the Coliseum at 11 o'clock this morning for the election of officers and the transaction of such other business as should come before this meeting.

* * *

L. A. Downs, president of the American Railway Engineering Association, was host to the members of the Board of Direction, the Committee on Arrangements and past presidents, a total of 25, at a dinner at the Chicago Athletic Club at 7 o'clock last evening.

* * *

Delegates of the various railway sections of the American Association of Engineers held a business meeting in the Green room of the Congress hotel yesterday to discuss administrative matters of the organization. The conference was concerned primarily with ways and means of developing a more closely knit organization of the railway members of the association.

* * *

C. Y. Tu, a representative of the Chinese Government Railways, who is in this country making a study of railway signal apparatus for his government, attended the Signal section meeting Monday. Mr. Tu has been accepted as a member of the Signal section and intends to follow up the activities of this association.

* * *

From the middle of the Pacific to Chicago for the primary purpose of attending the convention and the N. R. A. A. exhibit is the interesting thing about W. D. Cleveland, Honolulu, unless perchance it is the additional fact that an absence of seven years from the convention has but made him all the more intent upon getting here before another year passes by. Mr. Cleveland is signal supervisor of the Oahu Railway & Land Company, a Class I road of 114 miles, operating between Honolulu and Kuku on the Island of Oahu.

* * *

The annual dinner of the American Railway Engineering Association will be held in the Gold Room of the Congress Hotel tomorrow evening. The speakers will include General R. C. Marshall, Jr., general manager of the Associated General Contractors of America, Washington, D. C., and formerly chief of the construction division of the United States Army; Hon. James A. Mulligan, K. C., Sudbury, Ontario, and Gus W. Dyer, professor of economics at Vanderbilt University, Nashville, Tenn.

* * *

William John Jackson, division engineer of the Minnesota division of the Chicago & North Western, with headquarters at Winona, Minn., died on March 13 from pneumonia. Mr. Jackson was born at Chicago, Ill., on January 7, 1873, and was educated at the University of Illinois. He began engineering work with the Chicago & Northwestern as a tapeman on April 1, 1899, and served as rodman, instrumentman and assistant engineer until he was appointed acting division engineer of the Minnesota and Dakota division on May 15, 1909. He was promoted to acting division engineer of the Ashland division on April 1, 1912, and division engineer of the Madison division on January 11, 1913, being transferred to the Minnesota and Dakota division on May 12, 1913, where he remained until his death.

The A. R. E. A. Program

The twenty-third annual convention of the American Railway Engineering Association will open in the Florentine room this morning. The program for the three days is as follows, morning sessions extending from 9 to 12:30 and afternoon sessions from 2 to 5:30.

First Day—Tuesday, March 14

President's Address.
Reports of Secretary and Treasurer.
Reports of Standing and Special Committees:

XXIII.	Shops and Locomotive Terminals	Bulletin 241
XIV.	Yards and Terminals	Bulletin 239
XXII.	Economics of Railway Labor	Bulletin 243
II.	Ballast	Bulletin 239
XV.	Iron and Steel Structures	Bulletin 240
Special.	Standardization	Bulletin 240
X.	Signals and interlocking	Bulletin 240
III.	Ties	Bulletin 240
Special.	Stresses in Railroad Track	Bulletin 241

Second Day—Wednesday, March 15

V.	Track	Bulletin 243
XXIII.	Shops and Locomotive Terminals	Bulletin 241
I.	Roadway	Bulletin 241
XVI.	Economics of Railway Location	Bulletin 241
XVIII.	Electricity	Bulletins 239, 241
XI.	Records and Accounts	Bulletin 242
IX.	Signs, Fences and Crossings	Bulletin 242
XIII.	Water Service	Bulletin 242
XX.	Uniform General Contract Forms	Bulletin 242

Annual Dinner at 6:30 P. M. (Gold Room, Congress Hotel)

Third Day—Thursday, March 16

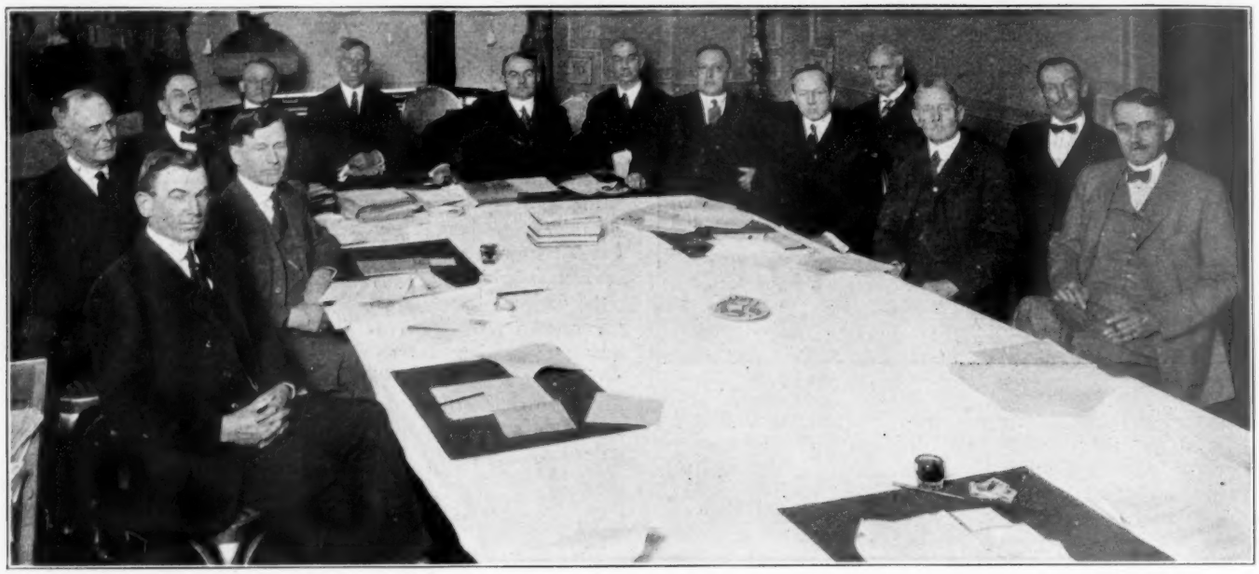
VIII.	Masonry	Bulletin 242
IV.	Rail	Bulletin 243
VII.	Wooden Bridges and Trestles	Bulletin 243
XXI.	Economics of Railway Operation	Bulletin 243
VI.	Buildings	Bulletin 245
XVII.	Wood Preservation	Bulletin 245
XII.	Rules and Organization	Bulletin 245

Memorial Meeting—John Findley Wallace (Bulletin 244).
New Business.
Election and Installation of Officers.
Adjournment.

Signal Section Program

The following reports will come up for consideration at the meeting of the Signal section at the Drake today:

Committee II—Mechanical Interlocking.
Committee XIX—Railway Economics.
Committee XII—Contracts.
Committee XIII—Electrical Testing.
Committee XV—Valuation.
Committee XVIII—D. C. Track Circuits.



A. R. E. A. Board of Direction in Session Yesterday

The Association's Opportunity for Service

New Conditions in the Railway Field Offer Larger Responsibilities and Greater Possibilities for Organized Work

WITHIN THE LAST FEW YEARS a marked tendency towards co-ordination of activities has been evident among the organizations in the railway field. This has been evidenced by the amalgamation of a number of associations with the American Railway Association. In the engineering field it has appeared in the form of a co-operative arrangement. The motive prompting this development has been the desire to eliminate duplication of effort and to promote unified action in efforts to increase efficiency of railway operation. Becoming a part of a larger organization interested in all branches of railway operation has tended to stimulate the associations to greater activity along broader lines. This tendency has been particularly marked in the American Railway Engineering Association, for of late it has given more attention to the broader phases of engineering in transportation than ever before. In the first of the two papers which follow, R. H. Aishton, president of the American Railway Association, points out the responsibility which the American Railway Engineering Association (the Engineering Division of the American Railway Association) bears to the railway industry, while in the second paper, L. A. Downs, president of the engineering association, touches on some of the work which the association is now doing in this direction.

What the Association Can Do

BY R. H. AISHTON

President, American Railway Association

The period of the world war and the boom which followed was an orgy of spending, much of it necessary, some of it unnecessary. In a way it was a draft made upon the future earnings of our country, which, like all other drafts, has to be paid, and the time of payment is now here or past due. Hence the insistency and appeal of the call which has gone out for greater thrift, greater efficiency and greater economy in all lines. Thrift in business, and especially in large business, calls particularly for the knowledge and training of the engineer, and this was never more so than at the present time. Especially is this true of the engineer whose specialty is in transportation problems.

The costs of transportation as represented in charges for that service are so widely distributed that it is perfectly natural that there is a great or greater interest on the part of the public generally as to whether the railroads are managed economically and efficiently than in other lines of business. This thought has impressed itself upon Congress, as is indicated in the legislation enacted to provide the means under which the railroad corporations were to take over their properties at the end of the period of federal control, which legislation placed upon the carriers the express duty of operating their properties in an honest, efficient and economical manner, and placed upon the Interstate Commerce Commission the necessity of considering this question in fixing the measure of return.

There is no other business so subject to publicity and scrutiny as that of the railroads. This is nothing new, for it has existed for a very considerable number of years. The railroad business, the manufacture of transportation, is an industry by itself, and there are no methods of comparison with other industries that are conclusive. The records made by the railways in safety, in economy and in efficiency have been a continuously progressive movement and the engineer has had a very large part, both individually and through associations such as the American Railway Engineering Association, in the development of this forward movement.

The individual railroads have always striven for the greatest economy of operation. That must be perfectly patent to the average business man from the mere appreciation of the fact that, regardless of their public functions, the railroads are private property, supported and dependent upon private capital, and must therefore show earning capacity. This requires at least the same measure of economy and efficiency as is required of other private

business also engaged in the respectable project of making money for its owners, and of the exercise of courage, initiative and research continually to bring about conditions that will produce greater economies.

The railroads of this country really anticipated the specific obligation which has been laid upon them by the Transportation Act of 1920 back in the early eighties, because it was appreciated many years before the enactment of the present law that the day would come when the railroads of this country could no longer be handled solely as individual units of private property. Arrangements and plans were then made for co-operative effort along lines that were productive of better service, greater efficiency and more economy. The foundation underlying the establishment of the American Railway Association, in the first place, and of all the various associations of men skilled in the different problems entering into transportation has been the recognized necessity for better methods, greater economies, larger efficiency and a better service to the public. The tendency for the last two or three years has been to a further co-ordination of all of these various activities centering through one channel, the American Railway Association, which is now operated really as a divisional organization, having in mind the co-ordination of the efforts of all these various activities in the one direction—economy, efficiency, service.

It has often been said that one defect of committee work is that it requires so much compromise as never to secure the best thought of all members of the committee in the long run, but merely an average. Admitting the partial truth of this statement, the experience of the reorganized American Railway Association thus far would seem to indicate quite clearly a very beneficial result to the railroads. While the standard practices which have been recommended (and this applies particularly to the engineering divisions) may not always have embodied what was considered the best thought on the subject on each individual railroad, it has embodied what was found by the majority action of the various divisions to be the best practice in each case. The recommendation of the association, and it must be understood that the power of the association goes only to recommendation (which, however, means in practically all cases adoption in some form), has resulted in the utilization in many cases of methods and practices which individual railroads, left to their own initiative and experiment, would perhaps have not been able to adopt in the first instance.

The work of the reorganized American Railway Association has only just begun. It is to be expected that it will develop, and develop very rapidly, in the near future. It is perfectly patent that even without the requirement of the statute, the public attitude toward the railroads would have required them so to co-ordinate their efforts in many features of operation and management as to reduce waste and to produce the greatest economy and efficiency. It is quite apparent from the beginning made that there is plenty of room in which yet to turn and a multitude of opportunities for the engineering profession. Much as that profession is already specialized, it is probably true that greater specialization is still possible and advisable, particularly with respect to railroads.

In this rather short sketch of the situation facing the railroads, and the manner in which the roads individually are meeting it, I have endeavored to place before you the important part that the American Railway Engineering Association and the Engineering Division of the American Railway Association have had in the development that has taken place on these lines in the past, and to indicate as my opinion that there never was a period where there were greater opportunities for constructive service in the broader phases of engineering and transportation than the present and the period that lays immediately ahead of this nation.

What the Association Is Doing

By L. A. Downs

President, American Railway Engineering Association

The American Railway Engineering Association, embracing within its membership as it does the leading engineers of the principal railways of the United States and Canada, has an unusual opportunity for service to the railways of this country. Through the personnel of its committees all the varied conditions of the country are represented, and a wide range of information is collected, dissected, digested and distributed for the benefit of all railways.

In addition to its efforts in the direction of distinctly engineering problems connected with the location, maintenance and operation of railways, it has in recent years taken up the study of some problems confronting railway owners to which engineering principles and knowledge can be applied to advantage.

Undoubtedly the question of the economical operation of railways is of more urgent importance at present than at any time in their history. The very existence of many properties is at stake and is dependent on the solution of some of the problems confronting railway managers today.

Among these there can be little doubt that the foremost is the labor question in its widest sense. For the purpose of studying some phases of this question the association has actively at work two committees, one on the Economics of Railway Labor, and another on the Economics of Railway Operation. This latter committee is giving very careful study to such subjects as Methods for Increasing the Efficiency of Employees, Methods for Increasing the Traffic of Railways, and the Effect of Speed of Trains on Cost of Operation. Other committees, such as those on "Yards and Terminals" and "Shops and Locomotive Terminals," are giving very careful study to the problem of producing plants which will facilitate the use of equipment in good order and reduce delay in restoring equipment in bad order to service.

Another committee whose work is tending to produce economy of operation is that on "Standardization." This work is designed to reduce the multiplicity of specifications for the various materials required in daily use on railways, and permit of the production of so-called "standard" materials at very much less cost than is possible under present practices.

A committee whose work should result in economies of much magnitude is that on "Stresses in Railroad Tracks." More exact and complete knowledge than has heretofore existed of the forces which have to be resisted by railway tracks will be available from their work, and this knowledge should make it possible to provide for them with certainty and without waste.

During the past year the necessity for effecting the greatest economies possible has been more pressing than ever before, and I believe the work of the association can well be directed in a large degree in the future to the study of the broad questions of economies of railway operation.

Purdue Luncheon

The annual luncheon in honor of visiting Purdue members attending the American Railway Engineering Association's annual meeting will be held at the Chicago Engineers' Club, 314 Federal Street, at 12:15 p. m. Wednesday, March 15. Dean Potter and others from the University will be in attendance.

Signal Section in Session Yesterday at the Drake Hotel

Signal Section Holds Its March Stated Meeting

Large Number in Attendance at Opening Session in the Drake Hotel Yesterday Morning

DEPARTING FROM THE PRACTICE in the past, the ninth annual session of the Signal Section dispensed with all opening business yesterday morning. The meeting was called to order at 10:15 a. m. by Chairman F. B. Wiegand, signal engineer, New York Central, Lines West, and the reports of committees were taken up immediately for consideration. During the afternoon session F. A. Westbrook, field engineer, Habirshaw Electric Cable Company, gave an illustrated lecture. Ten committees presented reports for action at the meeting yesterday, including those on Maintenance Rules and Instructions; Editing; D. C. Relays; Oils; Highway Crossing Protection; Batteries; Power Interlocking; Standard Designs; D. C. Automatic Block Signals; and Signaling Practice.

The committee on Editing found it necessary to review the General Provisions in the Manual because of the fact that there is now in the Manual a form of contract for block signal and interlocking work, a form of invitation to bidders on block signal and interlocking work, and specifications, which by slight amplification, will cover all of the details under the heading, "General Provisions." The committee also found that Standard Section No. 4 needs consideration. The results of the deliberations were submitted to the meeting. It has also been noted that the question of clearance, or clearance diagram requirements, is not referred to in any specifications, so that the committee appended recommendations to its report to cover this deficiency. The identification for a Requisite Sheet, whether it be part of a Major or Unit Specification, was given consideration, and recommendations are included in the report. There has been some discussion about the Warranty Clause used in the several specifications now in the Manual and recommendations on this subject were also included in the report..

F. B. Wiegand
Chairman

Report of Committee on Signaling Practice

THE COMMITTEE SUBMITTED reports on the following subjects:

The report on colors for signals will be found in the proceedings of the Signal section, pages A-399 to A-409, July, 1920, and the committee recommends that the subject be closed.

The Effect of Electric Headlights on Signals

But little difficulty has actually been experienced due to the effect of locomotive headlights and this has been largely eliminated with the abandonment of the arc light and the use of incandescent lamps in the headlights, with the consequent reduction in candlepower as well as the difference in characteristics of the two lights. The difficulties remaining are of three types:

1. The preventing of a locomotive engineer on one train reading the signals which govern him on account of the headlight on a train in the opposing direction blinding him. 2. Account of headlight on a train in the opposite direction showing through the colored glass on a dwarf signal other than the one in front of the lamp and so giv-

ing a wrong indication. 3. Account of light from locomotive headlight on a train being reflected back from a signal and so giving a wrong indication.

The first of these difficulties has been obviated where they occur, which was mostly on multiple track territory, by having the enginemen dim the headlights when approaching trains running in the opposite direction. The second difficulty has been obviated by arranging a shield on dwarf signals behind the colored glass of spectacles which are not in front of the lamp. The third difficulty has been obviated by either: (a) Adjustment of signal. (b) Use of convex roundels which will obviate the trouble should the signal not be in proper adjustment.

The committee recommended: 1. That a shield be installed on dwarf signals behind the colored roundels, not in front of the lamp. 2. That convex roundels be used on all new work and renewals.

The committee recommended that the report be accepted as information.

Committee: W. J. Eck (Southern), chairman; W. M. Vandersluis (I. C.), vice-chairman; W. E. Boland (S. P.), A. M. Burt (N. P.), C. A. Christofferson (N. P.), C. E. Denney (N. Y. C. & St. L.), C. A. Dunham (G. N.), W. H. Elliott (N. Y. C.), J. V. Hanna (K. C. T.), C. J. Kelloway (A. C. L.), H. K. Lowry (C. R. I. & P.), J. C. Mock (M. C.), F. P. Patenall (B .& O.), J. A. Peabody (C. & N. W.), F. W. Pfleging (U. P.), A. H. Rudd (P. R. R.), T. S. Stevens (A. T. & S. F.), E. G. Stradling (C. I. & L.), F. B. Wiegand (N. Y. C.).

Discussion

The report was accepted without discussion.

Report on Maintenance Rules and Instructions

In the preparation of rules for signal maintenance, this committee this year submitted those for motor cars, hand cars and velocipedes. Instructions for signal maintenance at mechanical interlockings and general rules for interlocking were also presented. The motor car instructions prescribe the manner in which this equipment must be handled and the precautions which should be taken by the men operating them. The rules for general maintenance at interlockings covers, among other things, the instructions which should be given a new leverman and the inspections necessary around the machine and on the ground.

G. K. Thomas
Chairman

G. K. Thomas has been the chairman of this committee since its organization two years ago. In September, 1911, Mr. Thomas was promoted from signal maintainer on the Atchison, Topeka & Santa Fe to signal foreman, later being advanced to the position of assistant signal engineer of the Santa Fe System. He is an advocate of maintenance rules and instruction as a means of not only increasing the efficiency of the field forces but also as a proper guide for new men entering the service and can present logical proof that proper rules accomplish the desired results. His work along this line on the Santa Fe particularly fits him to act as chairman.

THE COMMITTEE submitted for consideration reports on rules for signal maintenance and on examination papers on signal maintenance. The reports covering motor cars, track circuits and mechanical interlocking were adopted in 1920 and are now in the Manual. In line with the assignments at that time, these reports were presented under the general titles of Examination Papers on Signal Maintenance.

Rules for Signal Maintenance

MOTOR CARS, HAND CARS, VELOCIPEDES, ETC.

201. Safety is of the first importance in the operation of motor cars, hand cars, velocipedes, etc.
202. Cars are provided to facilitate work and must be used for railroad business only.
203. Under no circumstances may anyone be carried on motor or other cars without a permit from the proper official, except employees in the regular performance of their duty.
204. Privately owned cars must not be operated without authority from .....
205. Except in cases of emergency, cars must not be operated after dark, nor during storms or foggy weather.
206. When necessary to use hand, push or motor cars at night, great care must be taken. A white light must be displayed to the front and red light to the rear.
207. Cars must not be run through tunnels except when authorized by ....., and then only after complying with local requirements.
208. Cars must not be run over foreign lines unless authorized by .....
209. When necessary to operate two or more cars connected together, rigid couplings must be used and the propelling car must be in advance. Side drive cars must not be so connected.
210. Cars must not be overloaded.
211. Heavily loaded cars must be protected by flag.
212. Material and tools must be so loaded and secured that none can fall off or interfere with moving parts of the car.
213. Employees must not get on or off a moving car from the front or side.
214. Motor cars must be run with traffic except as covered by local rules.
215. Hand cars and velocipedes must be run against traffic except as covered by local rules.
216. Motor cars must not be run through spring frogs under power. They must be lifted over, when necessary, thus preventing damage to wheels, boxings and axles.
217. Cars must be run slowly over frogs, switches, derails, railroad crossings and other danger points.
218. Cars must run slowly through towns and over highway crossings and be prepared for immediate stop.
219. Cars must be under control and prepared for immediate stop when approaching gangs of workmen.
220. Motor cars must be pushed past station when platforms are occupied.
221. Motor cars must not be run past standing passenger trains.
222. Employees in charge of motor cars must keep themselves informed as to train movements, on constant lookout, and occupy the track only when it is safe to do so.
223. Employees in charge of cars must keep constant lookout for other cars occupying the track.
224. When a line-up of train movements is obtained it must not be considered final because operating conditions may require running of additional trains.
225. When two or more men are with a car, they should flag at curves and cuts where the view is obstructed or the side clearance is not sufficient to take off the car. If the car is operated with but one man, he must proceed with extreme care (walk if necessary), keeping a constant lookout for trains and motor cars in both directions.
226. A distance of at least 400 ft. should be maintained between hand cars and a distance of at least 1,000 ft. between a motor car and any other car or the rear end of a moving train.
227. Switches must not be thrown to run hand cars, empty cars, or light motor cars to or from the main track.

228. All persons riding on hand cars must be in a standing position, except when side seats are provided.

229. All persons riding on motor cars must be seated.

230. Side drive motor cars must not be run backwards unless they are designed and adjusted so that this movement can be made with safety.

231. The speed of cars must not exceed 5 mi. an hr. when adjacent track is occupied by a moving train.

232. Side drive motor cars must not exceed a speed of 20 mi. an hr.

233. Center drive motor cars must not exceed a speed of 25 mi. an hr.

234. When two or more men are with a car, they should have a thorough understanding as to what part each will take in removing it from the track in emergency.

235. Lookout must be kept for torpedoes on the rail. When such are found, steps should be taken to avoid exploding them, but if exploded, they must be replaced.

236. Motor cars should not be shipped in baggage cars except when it is absolutely necessary, and when so shipped, the fuel tanks must be carefully drained and all tank caps screwed down tightly.

237. Cars must not be left on the track unprotected. If necessary to leave car for any reason, it must be placed at least 6 ft. clear of the nearest rail and locked. Cars must not be left on public highways.

238. Motor cars, when not in use, must be kept under cover. When not in sheds, use canvas cover.

239. Changes in design or the use of special devices are not permitted without authority of .....

240. If it is necessary to carry an extra supply of gasoline, this must be in a properly constructed gasoline tight container painted red, with tops tightly screwed down.

241. Open lights of any description must not be used near gasoline receptacles.

242. Cars must be kept clean and properly lubricated. All bolts, nuts, screws, and connections must be tight, brakes must be kept in perfect condition and the car must be in gage and alignment. Excessive lost motion must not be allowed and all parts must be kept in good repair.

243. Before use, a motor car must be inspected to see that it is in good condition, a proper supply of gasoline and lubricating oils provided and the necessary tools, lights, fuses, torpedoes, etc., in place.

244. Study the instructions that come with the car. Do not make long runs with a new car. Stop often, lubricate freely and let motor cool.

245. In no case should more than six dry cells be used. Greater voltage may burn out or injure the coil.

246. To attain the best results with two cycle air-cooled motor car engines, oil and gasoline should be mixed thoroughly before it is put into the car, using about one-half pint of proper grade of oil to one gallon of gasoline. Do not mix oil with the gasoline for four cycle engines.

247. If a starting crank is provided it must be pulled upward when the charge is being compressed in the cylinder to avoid personal injury in case the engine should back fire.

248. The radiator and other parts of the cooling system of water-cooled engines must be protected from freezing. They must be drained when not in use.

Rules for Signal Maintentnce Interlocking

General

1001. Levers or other operating appliances of an interlocking plant should not be operated except for inspection or test and then only after a thorough understanding has been reached with the leverman.

1002. The operating lever of a device temporarily inoperative must be blocked and, or marked so that it is easily distinguishable.

1003. When repairs affecting operation are to be made, a thorough understanding must first be had with the leverman, who must again be notified when repairs are completed.

1004. If necessary to disconnect a switch, derail, movable point frog, facing point lock, detector bar or its equivalent, all switches, derails and movable point frogs affected must be secured for safe train operation and ..... notified.

1005. When a switch or movable point frog is disconnected, it must be securely spiked with two or more spikes, which are to be placed in the first and second ties back of the point at the closed side.

1006. When a derail is disconnected, it must be securely spiked or fastened in the required position.

1007. If necessary to spike one end of a crossover, the other end must be spiked in the corresponding position.

1008. The locking of an interlocking machine must not be changed nor removed from the machine except upon authority of .....

1009. If the locking of an interlocking machine becomes disarranged or broken, signals affected must be set to display their most restrictive indication; switches, etc., in the route affected, must be secured until repairs are made. In all such cases ..... must be notified.

1010. A new leverman should be given the following instructions:

(a) How to disconnect and secure switches, derails and other units in an emergency, so as to provide for the safe train operation.

(b) How to operate time leases and other forms of special apparatus.

(c) How to read the indicators, lights, etc.

(d) How to handle levers with special reference to the danger of forcing the lever when the switch points may be obstructed or other dangerous conditions are liable to exist.

(e) Any other information which appears to be necessary to the efficient and safe operation of the plant.

1011. Frequent inspection and tests must be made to insure that all signal appliances, including machine locking, etc., are in proper condition.

1012. Bolts, dowels, pins, nuts, nut locks, etc., must be in place and in good condition.

1013. Interlocking machines must be kept in good mechanical and electrical condition, clean, free from excessive lost motion, and bearing parts free and properly lubricated.

1014. Sufficient compression should be kept in latch springs to assure the proper movement of locking.

1015. Special apparatus used in connection with interlocking machines, such as time locks, lever locks, circuit controllers, etc., must be properly sealed or locked and must be opened and inspected upon authority of .....

1017. When the condition of switches or track does not admit of the proper operation or maintenance of the interlocking plant, ... must be notified.

1018. If the ties under the switch points are not in proper condition and maintained so that the switch points ride evenly on all tie plates, the track department should be called upon to correct the condition.

1019. The maximum allowable gage of track at interlocked switches, derails, moval point frogs and detector bars is ½ in. wider than standard. When exceeded, the track department must be called upon to correct the condition.

1020. Interlocked switches, split point derails and movable point frogs must be kept so adjusted that they cannot be locked when one ¼ in. rod is placed between stock rail and a point 6 in. back from switch point. There must be no excesseive spring of point or connections. When the point is open, there must be at least 4 in. between the point and the stock rail.

1021. If the points of an interlocked switch do not fit up to the stock rails properly, adjustments should be made at the switch adjustment. When the points fit properly, the lock rod should be adjusted so that holes are in proper position for the plunger. When adjustments are completed jam nuts must be set up tight.

1022. Switch and lock movements must have full stroke both normal and reversed. Plungers or locking dogs must be kept tight on the slide bar.

1023. Lock rods should enter plunger stand or locking brackets at right angles to the plunger. Holes or notches must have square edges and be no more than 1/16 in. larger than the plunger.

1024. Detector bar must be maintained so that it will rise a minimum of ¾ in. above the top of rail at every point before the function is unlocked and rest a maximum of ¼ in. below the top of rail at every point when the stroke is complete. When lever or switch machine is on center, the motion plates or links should be on center. Bar must be straight, without kinks and lie evenly along rail. Rail clips and motion plates and studs must be tight, rollers working freely, all parts free from dirt and excessive grease, and all bearing parts lubricated. Battered rail must be trimmed to prevent interference with the operation of the bar.

1025. Signals must be clean, properly painted and lubricated and working freely. Blades must assume the full position of each aspect.

1026. Circuit controllers on switches, split point derails or movable point frogs must be so adjusted that the contacts will not function when ¼-in. rod is placed between point and stock rail 6 in. back from the point.

1027. Circuit controllers on lifting type derails must be so adjusted that contacts will not function until the derail is within ½ in. of its full non-derailing position.

1028. Machine locking should be lubricated sparingly with ..... oil only.

1029. The prescribed lubricant only must be used in buffers, signal mechanisms and other special parts.

1030. Where no special lubricant is prescribed, black oil or

..... should be used and care taken not to apply it to excess nor on parts which do not require lubrication.

Rules for Signal Maintenance Interlocking

Mechanical

1066. If necessary to disconnect a pipe-connected device, this should be done at the first crank nearest the operated device.

1067. A circuit controller operated by a lever latch on a mechanical machine must be adjusted so that a normal contact will open before the latch block has reached a point about ⅜ in. from its normal position and a reverse contact will not be closed until the latch block is within about ⅜ in. of its reverse position.

1068. A circuit controller operated directly by a lever on a mechanical machine must be adjusted so that a normal contact will open before the lever is one inch from its normal position and reverse contact will not close until the lever is within one inch of its reverse position.

1069. Leadouts should be kept clean and maintained so as to have no excessive wear in cranks, pins or bearings and aligned so that movable parts do not interfere.

1070. Pipe lines must be kept free from weeds and dirt, in good condition and alignment and at least ¾ in. clearance must be maintained between pipe and base of rail. Rivets must be in place.

1071. Broken pipe and loose couplings or rivets must not be permitted. These can usually be detected by the presence of rust.

1072. Pipe carrier foundations should be level, rigid and in alignment.

1073. Pipe carrier foundation tops should be kept clean, level, securely attached to foundations and not less than 2 in. above ground.

1074. Pipe carriers must be clean and securely fastened, all parts in place and rollers free.

1075. The minimum allowable stroke in main pipe lines is as follows:

(a) For facing point lock and switch and lock movement ..... 8 in.

(b) For signals ..... 7 in.

(c) For switches, derails and movable point frogs ..... 6 in.

1076. When the stroke of a pipe in main pipe lines is less than the allowed minimum, it must be increased at the lever.

1077. If necessary to decrease the stroke at a pipe connected device, this should be done by redrilling the crank nearest the operated device.

1078. Cranks, compensators and deflecting bars should be clean, in alignment with pipe line, pins and rollers free and properly lubricated. Moving parts should not interfere nor have excessive lost motion.

1079. Cranks, compensators and deflecting bars should be in the position determined by compensation chart when lever is on center.

1080. The plunger of a facing point lock should have at least 8 in. stroke, and when its lever is in the normal position the end of the plunger should clear the lock rod 1 in. The end of the plunger must have square edges.

1081. When the signal lever is normal, the signal bar of a bolt lock should be up against the stop, the notch in signal bar should not exceed 2 in. in length. The notches must have square edges and the lock rod must enter the stand at right angles to the signal bar.

(a) Bolt locks used with switches, split point derails and movable point frogs should be so adjusted that the signal will not clear when a ¼-in. rod is placed between the point and the stock rail 6 in. back from the point.

(b) Bolt locks used with lifting type derails should be so adjusted that signals will not clear until derail is within ½ in. of the full non-derailing position.

1082. Circuit controllers operated by mechanical signals must be so adjusted that contacts will not function until signal blade is within 5 deg. of the controlling aspect.

1083. Circuit controllers, when operated by switch and lock movement slide bar or facing point lock plunger, must be so adjusted that contacts will not function until the slide bar or plunger has traveled to within ½ in. of its stroke.

Conclusions

The committee recommended that the rules for signal maintainers, for signal maintenance interlocking (general) and for signal maintenance interlocking (mechanical) be approved for presentation at the annual meeting, the latter to supersede similar rules now in the Manual.

In addition to the above rules, examination questions and answers were presented on motor cars, hand cars, velocipedes, etc., signal maintenance, interlocking, mechanical, and on signal maintenance interlocking, general. It was recommended that these also be approved for presentation at the annual meeting.

Committee: G. K. Thomas (A. T. & S. F.), chairman; E. A. Black (N. Y. C.), vice-chairman; A. Vallee (D. & H.), vice-chairman; R. C. Bingham (I. C.) O. W. Brandt (U. P.), S. F. Cooper (Erie), A. Davies (C. P. R.), Caleb Drake (C. & N. W.), C. M. Duffy (C. R. I. & P.), H. J. Foale (Wabash), F. C. Foster (L. & N.), A. P. Hix (T. R. R. of St. L.), T. G. Inwood (N. Y. C.), J. A. Johnson (M. K. & T.), Arthur Kelly (C. C. C. & St. L.), F. A. Selke (C. I. & L.), A. W. Stewart (A. C. L.), F. A. Tegeler (C. B. & Q.), I. A. Uhr, (St. L.-S. F.), E. Winans (A. T. & S. F.).

Discussion

G. K. Thomas (Chairman): The committee recommends, *and I so move, that the general title of those subjects adopted in 1920 be changed so as to be uniform with the examination papers approved in 1921.*

(*Motion carried.*)

(Chairman Thomas next submitted for consideration rules and revised examination papers on motor cars, hand cars, velocipedes, etc.)

C. K. Kelloway (A. C. L.): I would suggest adding the words "only on the authority of the despatcher or superintendent" after Rule 204.

Chairman Thomas: Would not that result in considerable delay at times?

Mr. Kelloway: Not necessarily; if the order is given by the superintendent it will be accompanied by a train order to that effect.

W. C. Johnson (C. St. P, M. & O.): Many of the railroads which have lines extending into storm invaded territory have had their telephone lines and signal lines down for weeks, and that would make the delay of the maintainer too long. A signal maintainer should be allowed to use his own judgment if he cannot get authority from the train despatcher or the superintendent.

T. S. Stevens (A. T. & S. F.): *I move that the sentence be allowed to stand as presented.*

(*Motion carried.*)

Mr. Kelloway: If Rule 204 is right, then Rule 207 is inconsistent.

W. J. Eck (Sou.): These rules are not in the same class as the standard code train rules, and at best they will be a guide for any individual railroad which desires to have a set of rules for that purpose. *I therefore move the acceptance of the rules and the examination questions as they stand.*

(*Motion carried.*)

(Chairman Thomas' next submitted the rules and examination papers for signal maintenance interlocking.)

J. H. Oppelt (N. Y. C. & St. L.): The remarks of Mr. Eck apply to these rules equally well, and *I therefore move that they be accepted as written.*

(*Motion carried.*)

L. L. Whitcomb (N. Y. C.): Rule 1080 states, "The plunger of a facing point lock should have at least an eight-inch stroke," while Rule 310 (e), in the Report of the Committee on Mechanical Interlocking, states "Facing point lock plungers shall have a travel of not less than seven inches." There is a difference of one inch.

Mr. Kelloway: I would suggest that the figure be changed to seven in the maintenance rule.

(The committee accepted the change.)

Chairman Thomas: *I move that the rules, questions and answers on motor cars, hand cars and velocipedes, and on interlocking, general and mechanical, be approved for presentation at the annual meeting.*

(*Motion carried.*)

(The committee was dismissed with the thanks of the Signal section.)

Report on Highway Crossing Protection

Highway crossing traffic has become almost as interstate as railroad traffic because of the use of the automobile and the protection of these crossings presents a real problem. The committee feels that in this respect it is very desirable to make the aspects of all signs and signals intended to warn travelers on highways of possible or existing danger at railroad crossings uniform throughout the country. Twelve recommendations were drawn up by the committee and six drawings showing the aspects of the signs and signals accompanied the recommendations. These recommendations should form a basis for the universal standardization of crossing protection.

James B. Latimer
Chairman

James B. Latimer, signal engineer of the Chicago, Burlington & Quincy, is the first man to be appointed chairman of this committee which was authorized at the annual meeting last June. Forty years' experience in the engineering, operating and signal departments of the Chicago, Burlington & Quincy qualifies him to direct the work of this important committee. Owing to his extended contact with the problems of highway crossing protection, Mr. Latimer is able to appreciate the viewpoint of the railroads and also of the general public which is using the highways with volume and character of traffic unlike anything anticipated in the past.

THIS COMMITTEE WAS appointed at a meeting of the Committee of Direction in Chicago on June 5, 1921. Owing to the fact that considerable preliminary data as to the practice of various railroads and the requirements of public authorities had to be collected, it was impossible to hold the first meeting until November.

C. L. Bardo, chairman of the committee of the American Railway Association on the Prevention of Accidents at Highway Crossings and Trespassing, advised J. E. Fairbanks, general secretary, that his committee had recommended that the question of the standardization of mechanical and electrical devices installed at highway crossings as a substitute for crossing gatemen and flagmen be referred to the Signal section and that a subcommittee of his committee be appointed to confer with the committee of the Signal section. Mr. Bardo also stated that "the association has adopted standard approach warning signs which have been made legal in several of the states. It is quite important in the interests of safety, both to trains and to travelers on the highway, that the visional aspects of mechanical highway crossing devices should as far as possible be standard or confined within reasonable limits, otherwise the value of mechanical highway crossing signals intended for the control of traffic at grade crossings may be readily lost because of the unfamiliarity of travelers from other localities with that particular device."

Recommendations

It was agreed by the committee on Highway Crossing Protection to present the following recommendations and report for the consideration of the Signal section at the March stated meeting:

1. It is recommended that the use of the advance warning sign recommended by the Committee on Grade Crossing Protection and Trespassing of Division I of the American Railway Association in its report of October 16, 1916, be continued as standard practice.
2. That the use of the hand stop sign recommended by the same committee be continued as standard practice.
3. That the arms of highway crossing gates be painted with alternate black and white stripes diagonally across the arms when in the horizontal position, as recommended by the above named committee.
4. That a sign composed of cross boards bearing the words "Railroad Crossing" in black letters on a white field is recommended as standard practice.
5. That at a crossing where it is desired that highway traffic stop before crossing the railroad tracks, an additional sign bearing the word "Stop" shall be attached to the mast bearing the cross boards.
6. That where conditions justify or require that the sign referred to in recommendation No. 1, or the sign referred to in recommendation No. 5, shall be made conspicuous during the hours of darkness it may be illuminated.
7. That a red light shall be exhibited at crossings at highways with railroads to stop highway traffic only when a train is approaching.
8. That where practicable the sign recommended in recommendation No. 4 or any automatic warning sign should be placed in the center of the highway, provided the railroad company can be relieved from claims arising out of personal injury or damage to property on account of collision with the sign.
9. That while believing that a properly marked crossing coupled with proper responsibility on the part of the public provides best for public safety, automatic devices are sometimes required by law, ordinance or orders of public commissions. When this occurs aspects and operation should be uniform. It is therefore recommended that visual automatic devices to indicate the approach of trains be confined to a swinging disc and light, or a flashing light.
10. That when the swinging disc and light is used, the disc be circular, 24 in. in diameter, with the word "Danger" curved with the circle at the bottom, light in the center, white background, black letters and a black border corresponding with the word "Danger" parallel with the upper edge of the disc and shown on the accompanying diagram, marked Exhibit "F."
11. That where automatic devices are considered necessary or are specified by federal, state or local authorities for the protection of highway traffic, the use of two-position devices provide the necessary and desirable indication.
12. That when automatic signal devices are used to indicate the approach of trains they should be so arranged as to indicate for 20 sec. before the arrival of a train at the crossing, based upon the fastest trains operated over that crossing.

The flashing light signal has been considered, but the committee has not had sufficient time to draft a recommendation as to the proper aspects for such a signal.

The committee believes that these recommendations, if adopted, will form a basis for the universal standardization of highway crossing protection which at present is

anything but uniform throughout the country. The use of the automobile for long journeys has made highway traffic almost as interstate as the railroad traffic itself and the great desideratum, as it appears to the committee, is to make the aspects of all signs and signals intended to warn travelers on highways of possible or existing danger at railroad crossings uniform throughout the country.

In this report the committee has not, it feels, completed its work. A great deal will be gained in the interests of uniformity and economy of installation and maintenance by standardizing many of the parts of the apparatus recommended to be used, for instance, the bolt spacing of the foundations for all iron masts may be standardized to great advantage, also the size and type of socket used in electric light bulbs, size and type of oil lamps for illuminating purposes, and many other small matters. Therefore the committee requests it be continued with a view to taking up such details.

Exhibit F, Banner for Automatic Highway Crossing Signal

Committee: J. B. Latimer (C. B. & Q.), chairman; C. J. Kelloway (A. C. L.), vice-chairman; C. A. Christofferson (N. P.), W. J. Eck (Sou.), A. R. Fugina (L. & N.), A. H. McKeen (U. P.), C. H. Morrison (N. Y. N. H. & H.), J. A. Peabody (C. & N. W.), E. K. Post (Penna.), W. Y. Scott (B. & M.), T. S. Stevens (A. T. & S. F.).

Discussion

J. B. Latimer (C. B. & Q.), Chairman, presented the report of Committee XX, Highway Crossing Protection.

Chairman Latimer: We were not given a definite assignment, but were asked to co-operate with the Committee on Grade Crossing Protection and Trespassing of Division 1, of which Mr. Barto is chairman.

(A motion to accept recommendations No. 1, No. 2 and No. 3 was carried.)

Chairman Latimer: The idea of this particular sign was taken from the A. R. E. A. crossing protection report, where they recommended cross-boards instead of triangular-shaped signs, and the dimensions were taken from the laws of 11 states.

W. H. Elliott (N. Y. C.): *I move the approval of this sign.*

(*Motion carried.*)

R. B. Elsworth (N. Y. C.): I would like some description of a crossing at which it is desired that a stop should be made before a vehicle or a person crosses the track.

Chairman Latimer: It was the sense of the committee that where we have wigwags and in some other places, it is not necessary for highway traffic to stop.

A. H. Rudd (P. R. R.): Isn't it a fact that the state of Illinois requires this stop sign at extra-hazardous crossings?

Chairman Latimer: I believe they do.

I. S. Raymer (P. & L. E.): I understand that the law in several states requires that in the case of all motor vehicles carrying passengers for fare, and of motor vehicles carrying freight, the driver of the vehicle must stop at all city railroad crossings and ascertain that the track is clear.

W. H. Elliott (N. Y. C.): I believe according to that view that recommendation No. 5 should be changed. I think the following should be included: "At a crossing where visual highway crossing signals are not plainly visible and effective, an additional sign bearing the word 'stop' is required and should be such and such a design."

O. R. Unger (M. P.): The rules for the operation of any particular device should be the same on all railroads, and we ought to arrange to have one system of crossing signals on the railroads at all crossings, so that when the people on the highway see them in the case of one railroad they will know what they mean when they see them on another railroad.

Mr. Elliott: I have suggested that if a light is displayed at a crossing of the highway with the railroad to stop traffic, a red light be used, and that only when a train is approaching.

(The revised wording suggested by Mr. Elliott, having the approval of the committee, was adopted.)

Mr. Rudd: Will the committee be willing to go further and say that where it was impracticable to place the warning sign in the center of the highway, it may be put on the right hand side?

Chairman Latimer: If you have two signs, the right hand one is more important, and if you have only one the center is the place.

J. C. Mock (M. C.): Some of us are figuring on less than ten feet as the height of these signs, because as vehicles approach the crossing the drivers do not look up, and if they are very close they cannot see up.

J. Pilkington (N. Y. N. H. & H.): There is a development, in regard to signboards throughout the country, of having an obstacle in the middle of the road—a concrete group, a mound of dirt, or a wooden fence—and in the center of the obstacle there is placed a sign at a low height, probably within five feet of the base of the mound, or lower. This comes within the range of an automobile headlight.

(Paragraph 8 as revised was adopted, after which Paragraph 9 was read.)

Mr. Rudd: There are many wigwag and flashing lights in service all over the country, but the instructions referred to the committee relate to the question of standardization of mechanical or electrical devices at highway crossings as a substitute for the crossing gateways.

The logical proposition is to display a stop sign stationary when trains are coming, and no sign when no trains are coming. A steady red light to be used when a train is approaching and no light shown when a train is not approaching.

E. G. Stradling (C. I. & L.): This section should not go on record as approving a swinging disc or any other automatic device to protect highway crossings.

Chairman Latimer: The committee does not recommend the use of a wigwag signal or any other automatic signal, but where a wigwag is ordered by the public authorities we think that we should standardize the use of the device.

T. S. Stevens (A. T. & S. F.): We have about 500 automatic flagmen and the Southern Pacific has probably the same number. They are good protection and we are winning suits by their use. We are taking off highway watchmen and putting in wigwags.

Mr. Rudd: *I move that the last three lines read as follows: The committee therefore recommended that visual automatic devices to indicate the approach of trains be confined to either non-flashing light or lights, or to a mechanism displaying a stop sign and red light when train is approaching, no light or sign when train is not approaching.*

(*Motion carried.*)

Mr. Rudd: *I move, the committee having received fairly 50-50 instructions, that this be referred back to the committee for further consideration.*

(*Motion carried.*)

(Chairman Latimer then read Paragraph 10, after which a motion was made and carried that it be referred back to the committee.)

C. F. Stoltz (C. C. C. & St. L.): I would like to have the committee define a two-position wigwag.

Chairman Latimer: It is the language used by the trade. What the committee had in mind in referring to a two-position wigwag was one which hung still when no train was approaching and moved when a train was approaching.

Mr. Stoltz: *I move that the words "two-position" in the next to the last line of Paragraph 11 be changed to "three-position."*

(*Motion lost.*)

F. P. Patenall (B. & O.): *I move that the matter in Paragraph 12 be made to read: "so arranged as to indicate for not less than 30 seconds before the arrival of a train at the crossing."*

Mr. Mock: If you make it 30 seconds you are getting away beyond the distance necessary. It means also the revision of all of our bell circuits and crossing circuits.

C. J. Kelloway (A. C. L.): *I move to amend that No. 12 be made to read "so arranged as to indicate for not less than 20 seconds."*

(*Motion as amended carried.*)

(The committee was dismissed with the thanks of the Signal section.)

Report on D. C. Automatic Block Signaling

Requisites for signal circuits as presented in the report of the committee may be considered as a foundation on which to base a railroad signal system. The fundamentals of these requisites are gleaned from years of experience and conscientious, painstaking study, and will furnish the signal field established standards of control circuits, switch protection, fouling circuits, and proper methods of locating signals in order that traffic may be handled properly. The report on approach lighting includes statistics from 11 roads showing the actual cost of installation and operation of electric lighted signals, together with information on control circuits for the lights.

C. F. Stoltz
Chairman

C. F. Stoltz, signal engineer of the Cleveland, Cincinnati, Chicago & St. Louis was appointed chairman of this committee in 1919. Mr. Stoltz became a member of the Railway Signal Association in 1913, and in 1914 was appointed a member of Committee IV. In 1916 he was appointed on the Committee on D. C. Relays where he has rendered valuable assistance in preparing specifications for the operating characteristics of signal relays. Mr. Stoltz entered railway service as a draftsman on the Cleveland, Cincinnati, Chicago & St. Louis in 1906. In 1910 he was appointed assistant signal engineer, and in 1913 he was promoted to signal engineer.

THE COMMITTEE SUBMITTED for consideration reports on: 1, Requisites for circuits, and on 2, Approach lighting of signals.

Requisites for Circuits

1. Insulated rail joints shall be placed opposite each other in main tracks and not less than 5 ft. or more than 15 ft. in advance of the signal.
2. Signals shall be controlled as far as practical by continuous track circuit.
3. All main track circuits shall be connected to provide the best possible protection against broken rails.
4. Turnouts and junctions shall be protected by track circuit extending to the clearance point or siding derail.
5. Non-interlocked crossovers between main tracks, and between main and other tracks, shall be equipped with plunger locked circuit controllers and locked in the normal position. Lever used to operate the locks and circuit controllers governing the signals in the direction signaled shall be located between the tracks in the center of crossover, or independent track circuits for protection of crossovers affecting the signals in the direction signaled may be used in lieu of the above.
6. All non-interlocked switches, derails, and movable point frogs, in or leading to the tracks signaled, shall be equipped with switch circuit controllers, or plunger lock circuit controller, or both.
7. At points where dead sections exceed five feet less than the distance between the inner wheel bases of opposite tracks on the shortest car, engine or caboose, special circuits of approved design shall be installed.
8. Track batteries shall be connected to feed away from crossings with electric railroads.
9. Each track circuit shall be insulated on all sides from all other track circuits, and from all siding, junction, and branch connections.
10. Control circuits for signals shall not be carried through contacts of tower indicators, switch indicators, or interlocking relays.
11. Where a signal location is between the fouling point of a trailing switch and a point 500 ft. in advance of the switch, protection shall be provided by the new signal in the rear through the use of an overlap.
12. Where a signal location is between the point of a facing switch and a point ..... feet beyond, the signal shall be arranged to indicate stop when the switch is reversed or misplaced.
13. Where two signals governing in the same direction are located less than braking distance apart, either signal when indicating stop shall cause an approach indication to be displayed at a signal in the rear located at a point equal to or greater than the required minimum braking distance.
14. The aspect displayed to approaching trains must conform to true block conditions. A signal, in changing from proceed to approach, or approach to proceed, must be limited to display either the approach or proceed indication.
15. When a train, followed by a second train, reverses direction while between passing sidings, trains will receive stop indications at the first signal location in the rear of the point where the first train reversed its direction.
16. Circuits shall be so arranged that in no case will a stop signal, or a stop and proceed signal indicate approach until the

rear of a train is under the protection of the next signal governing in the same direction.

17. Circuits shall be so arranged where trains are liable to overrun, making it necessary to back up, such as stations, water tanks, coal chutes, etc., protection should be provided by the next signal in the rear through the use of an overlap.

18. The positive and negative sides of track circuit repeating relays used for controlling signal apparatus shall be broken by the controlling track relay.

19. The positive and negative sides of signal slots or holding coils shall be broken by a relay, or relays, protecting the entire block.

20. The control of signal shall be such as to provide:

(a) That each train is protected in the rear by at least one stop, and one approach indication, or by one permissive signal denoting block occupied by a train running the same direction, and one approach indication.

(b) That where a track is signaled in both directions, each train is protected against opposing movements by at least one approach and one positive stop signal.

(c) An approach indication before reaching a stop indication, excepting at the first signal of an installation or at the starting signal from meeting points, where traffic direction signaling is used, when trains may receive a stop indication without previously receiving an approach indication.

(d) Against misplaced switches or derails by at least one stop and one approach indication in each direction signaled.

(e) That where traffic direction signaling is used, the reversing or misplacing of a switch located between meeting points will set all signals governing toward the switch between it and both meeting points to the stop position.

(f) That two opposing signals governing over the same track will not display approach or proceed indication, simultaneously authorizing two trains to move opposing each other.

(g) That the proceed indication of each signal will be directly controlled by the next signal governing in the same direction.

(h) That in traffic direction signaling two positive opposing signals will not display the proceed (permissive approach or clear) indications, simultaneously authorizing two trains to move from meeting points opposing each other.

(i) That, as far as practicable, apparatus shall be so constructed and circuits so arranged that the failure of any part controlling the operation of a signal shall cause it to display its most restrictive indication.

(j) That the battery or power supply for line circuits be placed at the end of circuit farthest from the function operated.

21. Circuits controlling permissive signals, which denote block occupied, shall provide:

1. A slow speed indication to follow a train into an occupied block.

2. A stop indication against opposing trains in the same block where tracks are signaled in both directions.

3. That opposing signals governing over the same track shall indicate stop when a permissive signal indicates approach.

22. Take-siding indicators, when displaying an indication to take siding, shall cause the next signal in the rear to indicate approach and the automatic signal on the same mast to indicate

.....

Circuit Adjuncts

A. Signal governing in one direction caused to indicate stop, when a converging or opposing signal governing over the same track indicates proceed.

B. A timing element interposed between the restoration of a signal to the stop position and the clearing of an opposing or converging signal governing over the same track, thus preventing a hurried change of route.

Report on Approach Lighting of Signals

In gathering data with reference to the subject, inquiry was made, by the committee, of 33 different railroads. Replies indicate progress as follows:

11 railroads have extensive installations.

11 railroads have test installations.

4 railroads have no installations but replies indicate that tests are planned.

3 railroads have no installations and indicate no interest in subject.

4 railroads made no reply.

The practice of the different roads in automatic lighting is quite varied as to material used, but the circuits all fall within the following four schemes:

1. Using back circuit of track relay, when the track circuit is of sufficient length and curvature track such that light be shown before engineman came in view of signal.

2. Lighting circuit closed by circuit controller operated by the mechanism of the opposing signal.

3. Special relay in series with the control circuit of signal.

4. Special relay in series with track battery.

The design of the lamp bulb is a very important element in the successful operation of electric lighted signals. There seems to be in use at the present time two general types of lamps, the 3½ volt lamp, developed by the Edison Lamp Works of the General Electric Company for this purpose and used on a separate battery, and a higher voltage lamp, about 12 or 13½ volts, which is used on the operating battery. The large majority of roads use the 3½ volt lamp. Committee VI is now working with lamp manufacturers to develop a suitable standard lamp for this purpose.

The general opinion seems to be in favor of a separate battery where primary battery is used on the signal system, the reasons being given as follows:

Reliability. In case of failure of signal operating battery, the light would still be functioning.

Steady Voltage. Free from the voltage fluctuations of a primary battery operating a motor signal.

No Failures Due to Lightning. Operating battery has line connection subject to lightning discharges and lamps connected thereto would be burned out.

Cost Data. Simple to keep data on cost of lighting signals.

Economical. With the 3½-volt, 0.25-amp. lamps energy consumption is less than with the 13.5-volt lamp.

There seems to be no objection to the use of approach lighting on double or multiple tracks. The opinion is expressed, however, that on a railroad of four or more tracks, all signal indications in a given direction should light up on the approach of a train on any track. It is evident that this must be done on account of the possibility of a light failure when two or more trains are approaching signals at the same location at the same time. There seems to be no other real complication arising on double track signaling with approach lighting.

There have been several serious objections raised in applying approach lighting to single track signaling. It seems, however, that what appears to be an objection on the part of some railroads, is not seriously objected to by others, or the condition is being met in some way that is safe and satisfactory and preserves the advantages to be obtained by the approach lighting scheme.

It appears that the principal objection raised to the approach lighting scheme is on account of there being no night indications, under certain conditions, requiring either the use of an oil light on certain signals or a continuous burning electric light.

The economy effected by the approach lighting scheme is real and considerable. Data submitted by several railroads vary in some particulars, but the average ratio is 3.5 to 1, showing that it costs 3.5 times as much to light with oil. The committee does not feel that the data submitted have been compiled with the proper accuracy to consider this ratio exactly correct and is of the opinion that the ratio will not be quite as high, possibly more like 2 to 1.

The committee recommended that requisites for circuits be presented for discussion and that the report on approach lighting of signals be accepted as information.

Committee: C. F. Stoltz (C. C. C. & St. L.), chairman; R. E. Green (M. C.), vice-chairman; T. A. Jones (P. R. R.), vice-chairman; F. H. Bagley (L. & N.), M. A. Baird (Erie), F. W. Bender (C. R. R. of N. J.), E. E. Bradley (W. M.), J. H. Butridge (I. C.), W. A. Dawson (N. Y. C.), G. H. Dryden (B. & O.), T. C. Hansen (N. P.), C. E. Hartvig (C. R. I. & P.), G. A. Kirley (B. & A.), W. J. Kocher (L. V.), H. H. Orr (C. & E. I.), E. B. Pry (P. R. R.), A. Reilly (D. L. & W.), B. H. Richards (D. & H.), C. Soper (L. I.), R. B. Arnold (C. & N. W.), R. S. Turner (U. P.), E. P. Weatherby (T. & P.).

Discussion

E. B. Smith (N. Y. C.): I don't believe that the Maintenance of Way Department will agree with us on installing insulated rail joints opposite each other in main tracks and on curves of more than 2 degrees.

B. J. Schwendt (T. & O. C.): As I understand it, these are requisites for direct current automatic signal circuits.

Chairman Stoltz: I do not see, if these are requisites, but what they would apply in any circuit, and if the gentleman finds that they will not apply in a. c. or in anything but d. c., we will be glad to consider changing them.

F. P. Patenall (B. & O.): Referring to Paragraph 2; "Signals shall be controlled as far as practical by con-

tinuous track circuit." Isn't that rather an unwise remark to make?

Chairman Stoltz: It will be impracticable to insulate a crossing frog and get a continuous track circuit through a solid crossing frog, and in that case the track circuit is not continuous.

Secretary Balliet: That statement is not a fact unless it is a solid frog which has been actually welded solidly—I mean a frog without splice bars in it. It can be done, and has been done for 20 years successfully.

Chairman Stoltz: It is not practicable to do so where there is only one track to cross.

W. H. Elliott (N. Y. C.): It would be well to revise Paragraph 7 to give a minimum length, rather than to state that it shall be 5 ft. less than the distance between the inner wheel bases of the shortest car length, etc. Our shortest car is a scale test car, which is 11 ft., and it is not practicable to arrange a special circuit for a 6 ft. length of dead section.

Chairman Stoltz: The committee will be glad to accept that and give it consideration.

A. R. Fugina (L. & N.): Referring to No. 6, I do not see the necessity of equipping the derail with a switch controller when the derail is pipe connected.

Chairman Stoltz: The committee is willing to go along with Mr. Fugina in a way, but not to eliminate the hand-thrown derail. It is not an interlocking derail, not a pipe connected derail.

J. C. Mock (M. C.): How about the words "provide the best possible protection against broken rails"? What does that mean?

Chairman Stoltz: In cases of junction in track, we can either follow any junction, or in some cases we can run a series circuit.

E. B. Smith (N. Y. C.): Has the committee decided whether a lock is a better proposition than a series circuit, or a circuit on a cross-over for protection? I believe that the lever is superior to any special track circuit on a cross-over to take care of the condition.

Chairman Stoltz: I will be glad to have your opinion. We have none of our own yet.

Mr. Mock: I think that Paragraph No. 1 is a very expensive proposition. I do not know of many roads that really conform to that now.

Mr. Smith: This runs into money if you go into it wholesale, but it means very little when you are changing rails. When we started to place joints opposite on a tangent track it means a cost of about $75,000 to make the change, but we placed them all opposite at but little cost when new rails were laid.

Mr. Kelloway: Referring to No. 1, I can readily see the necessity of insulated joints being placed opposite within interlocking territory, but I cannot see the necessity of them in automatic territory.

Mr. Post (P. R. R.): I think the reason that we placed the joints opposite each other was on account of some failures when the front wheels of the engine were passing over a joint—it was only 15 or 20 ft. between joints. The engine was moving very slowly, and in some way the signals were cleared up while the engine was passing that point.

(A motion to eliminate Paragraphs 15 and 17 and Sections F and H was carried, after which the committee was dismissed with the thanks of the Signal section.)

Report of Committee on Standard Designs

Continuing the work of standardization, the committee presented seven revised drawings covering signal pipe, trunking, switch point drilling, electric lock brackets, insulated switch adjustments and highway crossing gate lamps. Progress was reported on designs for switch fittings and on pipe and screw thread standardization. The investigation of and report on the best types of electric lamps for signal work was a subject assigned and after making various field observation tests, tentative voltage and current ratings, filament construction, bulb sizes, base, light center length and adapters were agreed upon. An adapter submitted for test purposes was approved.

F. P. Patenall
Chairman

F. P. Patenall is completing his seventh year as chairman of this committee. He has long been an active member of the association, having been president of the Railway Signal Association in 1914. He has had some forty-one years' experience in the railroad signal field, having started as a clerk in the signal department of the Lancashire & Yorkshire Railway in England in 1881. He worked for Stevens & Sons, signal contractors, for a year, and came to America in 1885 as an assistant foreman for the Union Switch & Signal Company. He was appointed signal supervisor of the Baltimore & Ohio in 1888 and to signal engineer in 1898.

THE COMMITTEE SUBMITTED for consideration the following revised standard designs and revisions in specifications, with the recommendations that they be approved for presentation at the annual meeting.

1015—One inch signal pipe and coupling (revised).
1176—Trunking—grooved type (revised).
1177—Trunking—built-up type (revised).
1299—Switch point drilling (revised).
1358—Electric lock brackets for applying locks in mechanical interlocking machines (revised).
1392—Switch adjustment—insulated (revised).
1499—Highway crossing gate lamp (revised).

Specification for One-Inch Soft Steel Signal Pipe

Section 3. Plugs (Revised). Plugs must be merchant bar steel 10 in. long, 31/32 in. in diam., drilled for 4 ¼-in. rivets with drill .257; spacing to be 1 in., 2 in., 4 in., 2 in., 1 in., the first and third holes to be in the same plane and the second and fourth holes at right angles thereto.

Specification for One-Inch Wrought Iron Signal Pipe

Section 3. Plugs (Revised). Plugs must be wrought iron or merchant bar steel, 10 in. long, 31/32 in. in diam., drilled for 4 ¼-in. rivets with drill .257; spacing to be 1 in., 2 in., 4 in., 2 in., 1 in., the first and third holes to be in the same plane and the second and fourth holes at right angles thereto.

Standard Designs for Switch Fittings

The committee reported progress. Two drawings showing two types of switch fittings are in process of

completion, and if permissible, the committee will submit these for approval at the annual meeting.

The Best Types of Electric Lamps for Signal Work

The committee reported progress.

Acting on the information obtained at the December, 1920, New York meeting, the committee has diligently prosecuted this matter to further conclusion, in connection with which valuable assistance has been rendered the committee by the lamp and lens manufacturers. For the purpose of field observations, the committee met at Corning, N. Y., in August and October, 1921, and after making various observation tests in the field, the following conclusions were tentatively agreed to:

Voltage Ratings. 3.5, 8, 10, 12, 13.5.
Current Ratings. 0.3 amp. for the 3.5 volt lamp, and 0.25 amp. for the 8, 10, 12 and 13.5 volt lamps.
Filament Construction. C-2 for the 3.5 volt lamp, and C-3 for the 8, 10, 12 and 13.5 volt lamps.
Bulb Sizes. S-11.
Base. Bayonet candelabra single contact.
Light Center Length. 1¼ in. measured from the top of the pins of the base to the center of the light source.
Adapters... Where an adapter is necessary in present installations to suit medium screw sockets, fitted thereto will be a single bayonet contact candelabra base and lamp.

A sample of this adapter was submitted to the committee and met its approval, and railroads have ordered a number of these adapters and lamps for practical test. The results will be reported at a later meeting.

Progress of Pipe Thread Standardization

The committee appointed E. K. Post as its representative to co-operate with the American Society of Mechanical Engineers, and a report concerning the conclusions arrived at is in the hands of the secretary. The American Society of Mechanical Engineers committee has been relieved. The committee recommended that the American Engineering Standards, pipe thread, approved December, 1919, as an American standard by the American Engineering Standards Committee be approved for presentation at the annual meeting.

Progress of Screw Thread Standardization

The committee appointed E. K. Post as its representative to co-operate with the American Society of Mechanical Engineers, and reported progress. The progress report made by the National Screw Thread Commission authorized by Congress, July 18, 1918, was approved June 19, 1920. A copy of this report is in the hands of the secretary.

Committee: F. P. Patenall (B. & O.), chairman; E. K. Post (P. R. R.), vice-chairman; C. A. Christofferson (N. P.), W. A. Hanert (N. Y. C.), C. J. Kelloway (A. C. L.), B. H. Mann (M. P.), J. C. Mock (M. C.), C. H. Morrison (N. Y. N. H. & H.), F. W. Pfleging (U. P.), M. E. Smith (D. L. & W.), T. S. Stevens (A. T. & S. F.).

Discussion

(On motion, Drawings 1015, 1176, 1177, 1299, 1358 and 1499 were appointed. The specifications for one-inch soft steel and one-inch wrought iron signal pipe were also approved for presentation at the annual meeting, after which the committee was dismissed with the thanks of the Signal section.)

Report of the Committee on Batteries

The specifications for storage battery jars, as given in the committee report, offer a definite outline to be followed in the inspection and tests of either glass or hard rubber jars. Although no reference is made to the materials employed, it is presumed that lead jars are not considered as recommended practice to be used extensively in the signal field. In checking the sizes of the jars a mandrel $\frac{1}{32}$ in. larger than the maximum outside dimension and $\frac{1}{32}$ in. smaller than the minimum inside dimension is used to determine variations in the walls that would otherwise cause trouble when assembling the battery for service.

Albert B. Himes
Chairman

Albert B. Himes has been chairman of this committee for two years. Mr. Himes entered the service of the Pennsylvania Railroad as a clerk in the motive power department. From 1901 to 1903 he was a batteryman on the Lehigh Valley and the Long Island. During the eight years following 1901, he spent considerable time in the signal departments of the Pennsylvania, the Central of New Jersey, the Union Pacific, the Philadelphia and Reading, and the Baltimore & Ohio, being appointed signal supervisor of the last named road in 1909. He was later advanced to signal inspector and then promoted to assistant signal engineer of the B. & O.

THE COMMITTEE SUBMITTED (1) Specification for storage battery jar, and (2) Specification for cement concrete battery box.

Specification for Storage Battery Jar

1. *Purpose.* (a) The purpose of this specification is to provide for storage battery jars.

2. *Drawings.* (a) Purchaser's drawing accompanying this specification and forming an essential part thereof, is as follows: Drawing 1224.

3. *Material and workmanship.* (a) Material and workmanship shall be first-class in every respect.

4. *Variations.* (a) Variations shall be within the limits specified on drawing 1224.

5. *Inspection.* (a) Purchaser may inspect the material at all stages of manufacture.

(b) Purchaser may inspect the completed product to determine that the requirements of this specification have been met.

(c) If the material has not been accepted at point of production and if, upon arrival at destination, it does not meet the requirements of this specification, it may be rejected and the contractor, upon request shall advise the purchaser what disposition is to be made of the defective material. The contractor shall pay all freight charges.

(d) If purchaser is to make inspection at point of production, it shall be so stated.

6. *Tests.* (a) Tests may be made at point of production or on samples submitted and may also be made at destination.

(b) Contractor shall give the purchaser sufficient notice of time when material will be ready for testing.

(c) Contractor shall provide at point of production apparatus and labor for making the required tests under supervision of the purchaser.

(d) If tests are to be made at point of production, it shall be so stated. Purchaser will distinctly indicate which of the tests herein specified are to be made and what portion of the material shall be tested.

(e) In checking the sizes of jars, a mandrel 1/32 in. larger than the maximum outside dimensions and 1/32 in. smaller than the minimum inside dimensions, as specified on drawing 1224, shall be used. Mandrels shall move freely into the inside of jar for a distance of 5/6 of the depth of the jar and over the outside for a distance of 1 in. from the top of jar.

7. *Packing*, 8. *Marking* and 9. *Warranty* are standard sections adopted in 1919.

The committee recommended the approval of these specifications for presentation at the annual meeting.

Committee: A. B. Himes (B. & O.), chairman; A. H. McKeen (U. P.), vice-chairman; R. F. Annear (C. R. I. & P.), J. G Bartell (L. V.), H. Hobson (A. T. & S. F.), J. F. Jacobs (C. R. R. of N. J.), T. L. Johnson (D. L. & W.), E. W. Kolb (B. R. & P.), H. G. Morgan (I. C.), S. U. Rhymer (C. & A.), F. C. Timmons (D. & H.), E. L. Watson (P. R. R.), A. H. Yocum (P. & R.)

Discussion

B. J. Schwendt (T. & O. C.): There is nothing mentioned as to the kind of jar, glass, rubber, or what.

A. B. Himes (Chairman): It is not provided in any place except in the drawing and the drawing will state it is glass.

Mr. Schwendt: May I suggest that the heading be "specification for glass storage battery jar."

Chairman Himes: The committee will consider that.

(On motion the specification was approved, after which the specification for cement concrete battery box was presented.)

T. S. Stevens (A. T. & S. F.): Has the committee given any consideration to the sheet iron cover?

Chairman Himes: The committee has given consideration to the sheet iron cover, and there is a subcommittee working on that subject now. This is a specification for the box which now appears in the Manual which provides for a cover of this kind.

E. J. Relph (U. P.): Committee 2 agreed that we would change our specification for sand to the following: "Sand shall be clean, sharp and coarse, free from humis content and from foreign matter that may contain a clay dust exceeding 5 per cent."

Mr. Kelloway: In accordance with the proposal which has been agreed upon in Committee 2, I would ask that the paragraph read as follows: "The size and pieces shall range from a minimum of ¼ in. to a maximum of ¾ in., in their greatest dimensions."

Chairman Himes: The committee will consider

Mr. Relph: We also have added another clause which relates to a test for humis deposit in sand. It reads as follows: "Fill a wide-mouth bottle two-thirds full of the suspected material, and add sufficient 4 per cent solution of sodium hydroxide to fill the bottle. Shake occasionally, and if after 24 hr. solution is not darker than a straw color, it is safe; if very dark it must not be used."

(The committee was dismissed with the thanks of the Signal section.)

Report of Committee on Specifications for Oils

In order that the standard requirements for illuminating oils may be raised, permitting a better grade of oil to be obtained for railroad service, this committee has been making a careful study of the provisions which should be included in such a specification. The result of this study is incorporated in the specification presented for illuminating oil. It requires that the oil shall conform to certain requirements as to color, photometric test, flash test, cloud test, floc test, doctor test, sulphur content, distillation range and moisture. The methods to be employed in conducting the various tests are described in detail with a list of the apparatus required.

Ira S. Raymer
Chairman

Ira S. Raymer is completing his third year as chairman of the committee, having been appointed to this position in 1919. Mr. Raymer began work with the Union Switch & Signal Company in 1898 and in March, 1899 entered the signal department of the Pittsburgh & Lake Erie, on which road he is now signal engineer. In 1900 he became a member of the Railway Signal Club, later the Railway Signal Association and now the Signal section of the A. R. A. He has been active in committee work since 1907, when he was on the committee on Storage Batteries. He was also chairman of another committee of the Association for three years.

THE COMMITTEE submitted for consideration a specification for illuminating oil, with the view of raising the standard requirements.

Specification for Illuminating Oil

1. Purpose. (a) The purpose of this specification is to provide for a grade of illuminating oil for use where a long time burning oil is required.

2. Material. (a) The oil shall be free from water, glue and other foreign matter.

(b) The oil shall conform to the following requirements:

1. Color. The oil shall be clear and the color shall not be darker than No. 21 Saybolt. The sample shall not be filtered before making color test.

2. Photometric test. At start of test, flame shall be not less than.....candle power. At 24-hour period, flame shall not be less than.....candle power. At 48-hour period, flame shall not be less than.....candle power. At 72-hour period, flame shall not be less than.....candle power. At 96-hour period, flame shall not be less than.....candle power. At 120-hour period, flame shall not be less than.....candle power. At 144-hour period, flame shall not be less than.....candle power. At 168-hour period, flame shall not be less than.....candle power.

3. Flash. The flash point shall not be lower than 115 degrees F. (Tag closed cup.)

4. Cloud. The oil shall not show a cloud at 0 degree F.

5. Floc. The floc test shall be negative and shall not darken the color below No. 14 Saybolt.

6. Doctor. The doctor test shall be negative.

7. Sulphur. The sulphur shall not be more than 0.06 per cent.

8. Distillation Range. The temperature limits for the distillation shall be as follows:

	Fahrenheit
Initial boiling point	... deg.
10% shall be distilled below	400 deg.
20% shall be distilled below	415 deg.
30% shall be distilled below	425 deg.
40% shall be distilled below	435 deg.
50% shall be distilled below	445 deg.
60% shall be distilled below	460 deg.
70% shall be distilled below	475 deg.
80% shall be distilled below	495 deg.
90% shall be distilled below	515 deg.
95% shall be distilled below	540 deg.
98% shall be distilled below (End point)	550 deg.

The distillation loss shall not exceed 2 per cent when the residue in the flask is cooled and added to the distillate in the receiver.

9. Moisture. None.

3. Inspection is covered by standard sections (S. S. 6-b) 1919, (S. S. 6-c) 1919, (S. S. 6-d) 1917.

4. Tests. Tests are according to standard sections (a) (S.S. 7-a) 1919; (b) (S.S. 7-b) 1919; (c) (S.S. 7-c); (d) Samples for test shall be taken from near the bottom of the oil in the container by use of a thief.

5. Marking. (a) Purchaser's order, requisition and package number, name of consignor, and name and address of consignee, shall be plainly marked on outside of package.

(b) Detail list of containers and their contents shall be furnished for each shipment. Where carload shipments are made, routing and car identification shall be shown.

(c) Where carload shipments are made, each container shall be marked showing contents; order number and address may be omitted.

6. Packing. (a) The oil shall be put in clean, dry metal containers of the kind and capacity as specified by the purchaser.

7. Methods of testing. (a) Tests shall be made with the following methods and apparatus:

(b) Color Test: 1. Saybolt universal chromometer consists of two similar glass tubes 20 in. long and about five-eighths inch in internal diameter. One tube is open at both ends; the other (the oil tube) is permanently closed at the bottom with a colorless glass disk. The oil tube is provided with a pet cock *on the side at the bottom.* The tubes are supported in a vertical position above a mirror arranged to reflect light upward through the tubes. Above the tube is an eyepiece so designed that the field of vision is equally divided between the two tubes. A colored yellow glass disk is placed at the bottom of the open tube.

(c) Photometric Test. 1. The apparatus consists of a standard R. S. A. semaphore lamp, burner and chimney with the interior painted a flat black to absorb reflected rays, and a brass disk 5 in. in diameter by ⅛ in. thick, having a 2-in. circular hole in the center, replacing the lens. A 2-in. brass tube is fitted securely in the hole and extended outward 9.72 in. from the nearest surface of the lamp flame. The interior of the brass tube and disk are made a dull black to absorb reflected rays. A MacBeth illuminometer reading direct candle power is attached to the outer end of the brass tube.

2. Twenty-five ounces of the sample of oil to be tested shall be placed in the fount of the standard lamp, using a standard burner and chimney and a wick that has been washed in ether.

3. The wick shall be adjusted after the lamp has been burning one-half hour to get the best candle power of the flame and shall not be changed again during the test. The photometric value of the flame shall be taken one-half hour after the lamp is lighted and at each succeeding 24-hr. period until the end of the test.

(d) Flash Test. 1. The Tag closed tester consists of an oil cup surrounded by a water bath supported over an alcohol or gas burner. The water bath is provided with an overflow tube to maintain a constant level. The apparatus is provided with a cover, thermometer supports, test flame holder, and gage.

(e) Cloud Test. 1. Place 1½ ozs. of the oil to be tested in a 4-oz. sample bottle. Insert cold test thermometer in the cork so that the bulb is centrally placed in the oil. Keep oil cooled to the specified temperature for 10 min. by placing the bottle in a cooling mixture of cracked ice and salt in proportion of one to two. The salt shall be dry and fine enough to pass through a 20-in. mesh screen. To keep all parts of the oil at a uniform temperature, the bottle should occasionally be given a rotary motion. The oil should not show a cloudy appearance at the end of the test.

(f) Floc Test. 1. Place a small layer of sand in the bottom of a hemispherical iron dish. Filter if necessary to eliminate suspended matter, 300 c. c. of oil, which shall be placed in a 500 c. c. Florence or Erlenmeyer flask. Suspend the thermometer in the oil by means of a slotted cork. Heat the bath so that the oil will reach the temperature of 255 deg. F. at the end of one hour, maintaining this temperature with a tolerance of 5 degrees for 6 hours. At the conclusion of the test the oil shall comply with the color requirement and on a slight rotary motion of the flask no suspended matter or floc shall be present.

(g) Doctor Test. 1. Preparation of Reagents: Sodium plumbite or "Doctor Solution." Dissolve approximately 125 grams of sodium hydroxide (NaOH) in a liter of distilled water. Add 60 to 70 grams of litharge (PbO) and shake vigorously for 15 to 30 mins., or let it stand with occasional shaking for a least a day. Allow to settle and decant or siphon off the clear liquid. Filtration through a mat of asbestos may be employed if the solution does not settle clear. The solution should be kept in a bottle tightly stoppered with a cork. Sulphur: Pure flowers of sulphur.

2. Making of test: Shake vigorously together two volumes of oil and one volume of the "doctor solution" (10 c. c. of oil and 5 c. c. of "doctor solution") in an ordinary test tube; or proportional quantities in a 4-oz. oil sample bottle may be conveniently used. After shaking for about 15 sec., a small pinch of flowers of sulphur should be added and the tube again shaken for 15 sec. and allowed to settle. The quantity of sulphur used should be such that practically all of the sulphur floats on the surface separating the oil from the "doctor solution."

3. Interpretation of results: If the oil is discolored or if the sulphur film is so dark that its yellow surface is noticeably masked, the test shall be reported as positive and the oil condemned as "sour." If the liquid remains unchanged in color and if the sulphur film is bright yellow or only slightly discolored with gray or flecked with black, the test shall be reported *negative* and the oil considered "sweet."

(h) Sulphur Test. 1. Apparatus includes a small lamp, an absorber containing glass beads, a chimney, an exit tube, and a wooden base for the absorbers; filter pump or some other means of obtaining an air suction on the absorber, extra wicking for lamps, rubber tubing for suction connected with exit, a solution of HCL (1 c. c.-0.002275 gm.), a solution of Na_2CO_3 (1 c. c.-0.003306 gm.) and a one per cent solution of methyl oranges. The absorber and chimney should be made of glass having a low solubility. For a lamp one can use a small Erlenmeyer flask (25 c. c.). Insert in the flask a cork, through which runs a glass tube. Inside the glass tube insert a wick made of cotton wicking. A slot should be made on the side of the cork to allow air to enter the Erlenmeyer flask and thus avoid a vacuum.

(i) Distillation Test. 1. Apparatus: Distillation flask and support. The flask used shall be the standard 100 c. c. Engler flask, described in the various text-books on petroleum. Position of vapor tube, 9 c.m. (3.55 in.) above the surface of the oil when the flask contains its charge of 100 c. c. The flask shall be supported on a ring of asbestos having a circular opening 1½ in. in diameter.

2. The thermometer shall be made of selected enamel-backed tubing having a diameter of between 5.5 and 7 m.m. The total length shall be approximately 380 m.m. The range shall cover 30 deg. F. to 750 deg. F. with the length of the graduated portion between 280 and 300 m.m.

3. The condenser shall consist of a thin-walled tube of brass or copper, ½-in. internal diameter and 22 in. long. It shall be set at an angle of 75 deg. from the perpendicular and shall be surrounded with a cooling jacket of the through type. The lower end of the condenser shall be cut off at an acute angle and shall be curved down for a length of 3 in. The condenser jacket shall be 15 in. long.

The committee recommended that the specification for tests of illuminating oil be accepted for discussion.

Committee: I. S. Raymer (P. & L. E.), chairman; E. B. Smith (N. Y. C.), vice-chairman; C. H. Burnette (Monongahela); C. F. Jones (Sou. Lines West); L. E. Kinch (P. R. R.), B. F. Oler (P. R. R.), D. S. Rice (L. V.), B. H. Richards (D. & H.), W. S. Storms (Erie), Guy Tuft (P. R. R.).

Discussion

I. S. Rayner (Chairman): There is quite a difference of opinion as to how high the flame should be while the lamp is going through the test. We are pretty much of the opinion now that ½-in. flame is high enough for the maximum height, and that probably a ⅜-in. flame is not too low for the minimum height. We have found quite a variation in the performance of the wicks under capillary attraction and that temperature has quite an effect on the illuminating power of the oil. A drop of 50 deg. temperature will cause a drop of the flame of ⅛ in. If any oil has been received or is being received that is not sat-

isfactory, the committee would deem it a great favor if about one gallon of that oil were sent by express to the chairman. We are trying to develop information to determine whether it is not a fact that the distillation test, provided the oil is pure, will not run parallel with the illuminating test.

E. B. Smith: We have been trying to check the photometric test with the distillation range, to try to work the specification out so that the photometric test will tell you what your oil is.

Chairman Raymer: The distillation test is the most valuable test in the oil specification. It shows where the manufacturer has made his cut between gasoline and kerosene and between kerosene and the heavier fuel oil. We do not say anything about specific gravity. We do not want it. We want to have the manufacturer cut somewhere between 350 and 400 between gasoline and illuminating oil, and somewhere about 550 between the illuminating oil and the fuel oil. If we can get that put across, and in addition to that the test which will eliminate the impurities, I believe we will have an oil that will burn for 15 or 20 days.

A. T. Ambach (B. & O.): The committee should consider the method of storage and handling of oil. That is one of the most vital things that the railroads are interested in.

Chairman Raymer: We have no instructions about the handling of the oil in the field, but if it is the wish of the Board of Direction to instruct us to bring in rules on the handling of oil, we would be glad to take that matter up.

Mr. Elliott: I would suggest that the Committee on Committees be instructed to look into that matter. We may have a good specification, yet at the same time we would spoil all we have secured by this good specification by improper methods of handling and storage.

The specification for illuminating oil, No. 5003, was approved for presentation at the annual meeting, and the committee dismissed with the thanks of the Signal section.

Report of Committee on D. C. Relays

In presenting tables showing relays of standard resistances and their operative characteristics the committee has attempted only to show those relays which predominate in railway signal work. The characteristics given are based on careful study and tests, and are presented for discussion. The importance of the relay to proper signal operation is unquestioned and it is essential that it operates under certain working conditions in order to reduce to a minimum false operation which might result in false proceed signal indications. Through the use of these tables, railroads may determine the condition of those relays which it has in service or stock.

Edward G. Stradling
Chairman

Edward G. Stradling is completing his fourth year as chairman of the committee, after having served previously as vice-chairman. He first engaged in signal work on the Union Pacific in 1906. After being with this company for two years, he resigned to accept an appointment as signal inspector on the Chicago, Indianapolis & Louisville, being promoted to signal engineer of this road in May, 1911. His jurisdiction was extended and his title changed to that of superintendent of telegraph and signals in May, 1920. He is a thorough student and has made a particularly close study of direct current relays, resulting in much constructive work.

THE COMMITTEE SUBMITTED a table of standard resistances of relays with their operative characteristics. This consisted of two tables showing relays of standard resistances and their operative characteristics.

Sub-committee B received statements showing that many railroads are using track relays of different resistances than the generally recognized 2 ohm and 4 ohm relays and the committee has endeavored to show, in the table, those relays that predominate. The values shown for the 4 ohm relays are in accordance with the requirements of the 1920 specifications of the Signal section, but the committee is of the opinion that with the improvement of the relay it should be possible to specify more desirable values. To obtain the values shown in both tables a relay mechanism built in accordance with the 1920 specifications was used and coils of the various resistances shown in the tables were applied to this mechanism and the values secured for the operative characteristics.

The operative characteristics shown in the tables for the relays of the different resistances with the exception of the 7 ohm and 11 ohm relays were obtained by making tests on the relays of the different manufacturers. The characteristics shown for the 7 ohm and 11 ohm relays were obtained from the relays of only one manufacturer, as the others did not have these resistances. These values were included in the table on account of the greater efficiency of these two relays, due to the characteristics of their coils.

Committee: E. G. Stradling (C. I. & L.), chairman; C. D. Cronk (N. Y. C.), vice-chairman; W. S. Adams (N. Y. C.), C. M. Acker (D. & H.), E. T. Ambach (B. & O.), B. H. Ayers (L. & N.), E. F. Champlin (Erie), J. J. Corcoran (N. Y. C.), A. R. Fugina (L. & N.), H. W. Lewis (L. V.), H. C. Price (Erie), C. F. Smith (U. P.), J. E. Stewart (P. R. R.), C. F. Stoltz (C. C. C. & St. L.), L. C. Walters (Sou.), W. B. Weatherbee (D. L. & W.), E. G. Wesson (C. B. & Q.).

Discussion

E. G. Stradling (Chairman): It appeared to the committee that under Table 1 some of these relays could be eliminated. The wide variety of resistances now used necessitates the manufacturer making and carrying on hand too many different resistances for track relays.

C. G. Stoltz (C. C. C. & St. L.): In order to get the sense of the meeting, *I move that the relays of 7, 11 and 16 ohms resistance, shown in the first table, be eliminated as standard resistances.*

T. S. Stevens (A. F. & S. F.): I do not believe any of these should be eliminated if they are used. I see no good reason why we cannot print all of these relays if they are in satisfactory operation. We are not recom-

mending them. They are already in use. We are not discrediting their use if we leave them in.

J. B. Latimer (C. B. & Q.): I agree with Mr. Stevens, that we had better leave this paper alone and accept it as it is. The relay question seems to be the most intricate question we have in our profession.

(An amendment was submitted, after which the motion and amendment was put to a vote and lost.)

C. Drake (C. & N. W.): There is quite a large demand for a lower pick-up, four-ohm four-contact relay. I believe such a relay can be built with a maximum pick-up of 65 mils. which is perfectly safe.

F. L. Dodgson (Ten. Ry. Leg. Co.): If we are going to make any practical use of the relay characteristics of different resistances, these characteristics must be based upon some standard. The resistance of the relay is not a standard, because in order to get the specific resistance and have the coil efficient, that is a full coil, one of two things must be done—either you must use odd sizes of wire or the coils must be left small with a lesser number of ampere turns than are necessary.

Chairman Stradling: I think that is taken care of by the 1920 specifications, where we state, it should have full wound coil.

TABLE NO. I.

Operative Characteristics,
D.C. Relays Used for Track Circuits.

Nominal resistance.	Voltage range contacts.	No. of front contacts.	Physical armature air gap.	Min. front contact opening.	Saturation.	Min. drop-away without contact pressure.	Min. drop-away with contact pressure.	Maximum pick-up.	Maximum working current.
Ohms.	Range.	Contacts.	Inches.	Inches.	Amps.	Amps.	Amps.	Amps.	Amps.
2	1st	2	.020	.050	.450	.021	.043	.090	.180
2	1st	4	.015	.050	.450	.030	.047	.110	.200
4	1st	2	.020	.050	.300	.015	.035	.072	.160
4	1st	4	.015	.050	.300	.015	.037	.078	.120-
7	1st	4	.015	.050	.240	.011	.027	.060	.091
9	1st	4	.015	.050	.232	.011	.028	.070	.099
11	1st	4	.015	.050	.192	.008	.021	.048	.072
12	1st	4	.015	.050	.204	.009	.024	.061	.071
16	1st	4	.015	.050	.180	.008	.021	.064	.067

TABLE NO. II.

Operative Characteristics,
D.C. Relays Used for Line Circuits.

Nominal resistance.	Voltage range contacts.	No. of front contacts.	Physical armature air gap.	Min. front contact opening.	Saturation.	Min. drop-away without contact pressure.	Min. drop-away with contact pressure.	Maximum pick-up.	Maximum working current.
Ohms.	Range.	Contacts.	Inches.	Inches.	Amps.	Amps.	Amps.	Amps.	Amps.
500	1st	4	.015	.050	.018	.0015	.004	.008	.013
500	2nd	4	.015	.092	.018	.0015	.004	.010	.013
1000	1st	4	.015	.050	.010	.0011	.0025	.0053	.008
1000	2nd	4	.015	.092	.010	.0011	.0025	.006	.008

Operating Characteristics of D. C. Relays

(The committee was dismissed with the thanks of the Signal section.)

Report of Committee on Power Interlocking

In presenting specifications for the electric wiring of interlocking plants the committee has taken a long step in the direction of standardizing such construction. The requirement that 25 per cent space be allowed for additional wires in trunking or conduit, and the limiting of two wires to the terminal are good points in construction that were not considered in many past installations. Limiting the minimum size of conductors for various circuits and requiring the proper tagging are methods that will prove useful to those following the specifications. The requisite sheets will place a contract on a basis fair alike to the railroad and to the contractor.

Frank William Pfleging
Chairman

Frank William Pfleging is completing his first year as chairman of the committee, having been vice-chairman for one year, prior to which time he was a member of the committee for several years. He has been an active member in the signal field for a number of years, having been chairman of the Signal section during the preceding term. Mr. Pfleging entered railroad service as a signal maintainer on the Chicago & Eastern Illinois in 1899 and left this road in 1901 to join the signal department of the Union Pacific, where he was promoted to the position of signal engineer of the Lines East, the position which he now holds.

THE COMMITTEE SUBMITTED specifications for electric wiring for interlocking plants.

General

(1) Purpose, and (2) Drawings, are standard sections, 1919.

(3) Tender.—(a) The tender shall be for an installation meeting with the requirements of this specification. If the contractor wishes to vary from the specification, a tender may be submitted covering the changes he desires to make. This tender shall be accompanied by full information showing wherein the requirements of the specification are varied from.

(4) Requisite Sheet, and (5) Material and Workmanship, are standard sections, 1919.

(6) Inspection.—(a) Purchaser may inspect the installation at all stages to determine that the requirements of this specification have been met.

(7) Tests.—(a) Contractor shall make such tests as may be necessary to demonstrate to the satisfaction of the purchaser that the installation is in accordance with the requirements of the specification. The contractor shall provide such instruments and apparatus as may be necessary for making the tests. The instruments and the apparatus shall remain the property of the contractor.

(8) Warranty.—(a) Contractor shall replace at his own cost any part or parts of the installation furnished by him which shall within a period of one year from date of acceptance of installation fail to perform its proper function because of any defect in the application or erection of same.

(9) Clearance.—(a) Clearance shall conform to A. R. A. requirements unless otherwise specified on requisite sheet.

Detailed Specifications

WIRING

(10) Wiring.—(a) Underground and, or, aerial wiring from the interlocking machine to distributing points and between distributing points shall be multiple conductor cable, unless otherwise specified on requisite sheet. When not more than 10 wires are required, the aerial installation may be of single conductor wire.

(b) The wiring between apparatus in tower or power house and distributing points in tower shall be single conductor, unless otherwise specified on requisite sheet.

(c) The wiring from distributing points to units operated shall be of single conductor, unless otherwise specified on requisite sheet.

(d) Wire in trunking, chases or conduits shall be laid loosely without stretching or crowding, allowing a minimum of 25 per cent space for additional wires.

(e) Insulated wires or cables shall be drawn in by straight-away pull and wire shall not be bent or kinked in gripping to pull, or shall not be pulled around corners.

(f) Not more than 2 wires shall be connected to one binding post or terminal screw and they shall be separated by a washer.

(g) Wire leads to relays or other instruments which may be moved while in service, shall be of flexible wire as specified on requisite sheet.

(h) Wire and cables shall conform to A. R. A. Signal section specification, unless otherwise specified on requisite sheet.

(i) The wiring in tower and other associated buildings, shall be placed in metal conduit, unless otherwise specified on requisite sheet.

(11) Underground Wiring.—(a) Braided cable shall be used, unless otherwise specified on requisite sheet.

(b) Underground cable shall be drawn in accordance with A. R. A. specification, unless otherwise specified on requisite sheet.

(12) Aerial Wiring.—(a) Multiple conductor cable.

1. Aerial braided cable, A. R. A. Signal section specification, shall be used, unless otherwise specified on requisite sheet.

2. Aerial braided cable shall be installed in accordance with A. R. A. specification, unless otherwise specified on requisite sheet.

3. Cables shall terminate in cable boxes, as shown on purchaser's drawings.

(b) Single conductor wiring.

1. Line wire shall be as specified on requisite sheet.

2. Line wires shall be supported at each pole by crossarm, pins and insulators.

3. Crossarms, also braces, pins, bolts and other hardware, shall be in accordance with A. R. A. Signal section specifications.

4. Line wires shall terminate at a crossarm.

(13) Cable.—(a) Cables shall be composed of conductors as specified on requisite sheet.

(14) Wire Joints.—(a) Wire joints shall be in accordance with A. R. A. Signal section specification.

(b) Potheads and cable splices shall be in accordance with A. R. A. specifications, unless otherwise shown on requisite sheet.

(c) Joints or breaks shall not be made in other than open line except by permission of the purchaser.

(d) Wire ends terminating on binding posts shall be formed according to A. R. A. Signal section specification unless otherwise specified on requisite sheet.

(15) Conductors.—(a) Gauge of conductors shall be of sufficient size to permit operation of apparatus in accordance with A. R. A. Signal section specifications.

(b) No single conductor wires smaller than No. 16 A.W.G. shall be used for interior wiring.

(c) No smaller than No. 14 A.W.G. shall be used for exterior wiring.

(d) Line wire with breaking strength less than that of No. 10 A.W.G. hard drawn copper shall not be used.

(e) In main line cable work spare wires up to 25 per cent and in branch cable up to 10 per cent of the number in use shall be provided, unless otherwise specified on requisite sheet. When spare wires are required in other than cable work, the number and size shall be specified on requisite sheet.

(f) Connections to track shall be in accordance with A. R. A. Signal section drawing, unless otherwise specified on requisite sheet.

(16) Tagging.—(a) Each wire shall be identified near each terminal by means of a non-metallic tag or label, on which is stamped the wire designation corresponding to that shown on the circuit and wiring plan.

(b) Where practicable, the tags shall be securely fastened adjacent to the terminal, so that the number can be easily read.

(c) A non-corrosive metal tag identifying each line wire shall be nailed to the side of crossarm at each pole where wire terminates, unless otherwise specified on requisite sheet.

(17) Lightning Arresters.—(a) Lightning arresters shall be provided as specified on requisite sheet.

(b) Lightning arrester grounds shall conform to R. S. A. specification.

(c) Separate grounds shall be provided for high tension and low tension lightning aresters.

(18) Wire Terminal.—(a) Terminal blocks for wire and cable conductors shall be in accordance with R. S. A. 1056 and shall be installed in an accessible position and neatly arranged on terminal boards in housings, as shown on purchaser's plan.

(b) Wires used for maintainers' telephone shall be terminated as provided on requisite sheet.

The committee recommended that these specifications be accepted for presentation at the annual meeting.

Committee: F. W. Pfleging (U. P.), chairman; B. J. Schwendt (T. & O. C.), vice-chairman; W. C. Sibila (N. Y. C.), vice-chairman; F. J. Ackerman (K. C. T.), E. T. Ambach (B. & O.), F. L. Ball (D. L. & W.), L. E. Carpenter (P. R. R.), S. J. Dewey (C. C. C. & St. L.), E. N. Fox (B. & M.), James Fultz (T. St. L. & W.), N. S. Lynch (Mo. Pac.), J. W. MacCormack (K. C. T.), W. W. Morrison (N. Y. C.), J. H. Oppelt (N. Y. C. & St. L.), T. C. Seifert (C. B. & Q.), Walter Tyler (L. I.), O. R. Unger (Mo. P.), W. R. Young (G. T.), G. A. Ziehlke (U. P.).

Discussion

E. B. Smith (N. Y. C.): Section 10, Paragraph G, states: "Wire leads to relays or other instruments which may be moved while in service, shall be a flexible wire as specified on requisite sheet." I do not understand what "may be moved" means there. I know several years ago we used flexible wire connections to our relays, but we have them all out today and find much better service by running a solid wire to the relay.

B. J. Schwendt (Vice-Chairman): The committee had in mind shelf pipe relays or any other type.

B. F. Oler (Penna.): It would be well to use eyelets instead of "flexible wire."

Vice-Chairman Echwendt: The matter of making wire ends is referred to further on, and while eyelets are not specified, we specified the method used by the R. S. A., and made provision for other usages that may cover your point. The breaking strength of No. 10 A. W. G. hard-drawn copper is 894 lb. Is this minimum high enough?

W. H. Elliott (N. Y. C.): Would it not be advisable to place the breaking strength of No. 10 A. G. W. hard-drawn copper wire in this specification, to make it clear as to what the desired minimum strength should be?

Vice-Chairman Schwendt: The committee will be very glad to do that.

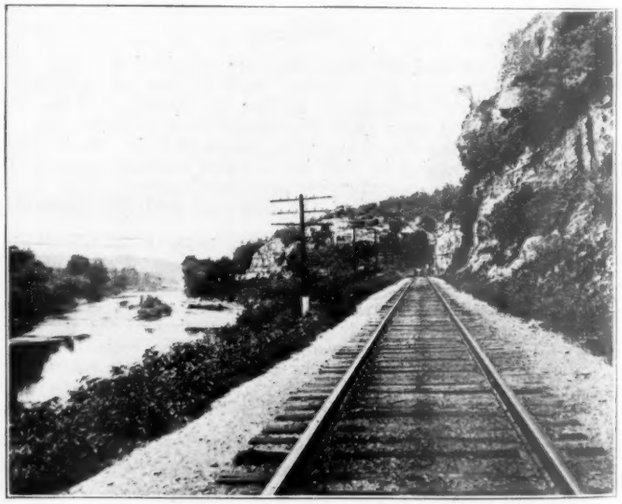
Mr. Smith: I would like to know if the committee has taken into consideration the use of a smaller wall for the wall insulation on the wire used for the interior work; in other words, go from 5/64 to 3/64 wall for the interior wiring.

Vice-Chairman Schwendt: The tendency seems to be to use smaller wall insulation in tower or interlocking station wiring, and the provision herein will give you that opportunity.

R. M. Phinney (C. & N. W.): In Paragraph 17, the words "high tension" and "low tension" are used. These are indefinite terms, and I suggest that the voltage ranges be specified instead.

Vice-Chairman Schwendt: The committee is glad to accept that.

(The committee was dismissed with the thanks of the Signal section.)



On the "River Division"

Registration of Signal Section, A. R. A.

THE REGISTRATION OF members and guests of the Signal Section of the American Railway Association at the Drake hotel yesterday totaled 334, as compared with a similar registration for the first day two years ago (the last March meeting of the Section) of 346.

Representative Members

Adams, T. S., sig. supr., N. Y. C., Watertown, N. Y.
Allan, T. A., chf. sig. inspr., G. T., Montreal, Que.
Amann, Paul, asst. sig. supr., Nor. Pac., Livingston, Mont.
Ambach, E. T., asst. sig. engr., B. & O., Cincinnati, Ohio.
Anderson, B. T., asst. sig. engr., D. L. & W., Hoboken, N. J.
Annear, R. F., sig. supr., C. R. I. & P., Des Moines, Ia.
Arnold, R. B., asst. engr., C. & N. W., Chicago.
Ashley, R. D., sig. inspr., I. C., Chicago.
Bagley, F. H., asst. sig. engr., L. & N., Louisville, Ky.
Baird, M. A., sig. engr., Erie, New York.
Baxter, H. H., chf. draftsman, C. & N. W., Chicago.
Bender, F. W., sig. engr., Cent. of N. J., Elizabeth, N. J.
Berry, E. S., engr., N. Y. C., Albany, N. Y.
Bingham, R. C., sig. inspr., I. C., Memphis, Tenn.
Black, E. A., pensioned, sig, supr., N. Y. C., Ashtabula, Ohio.
Boland, W. E. sig. engr., Sou. Pac., San Francisco, Cal.
Brownlee, E. M., supr. sigs., Penna., Indianapolis, Ind.
Buchanan, F. H., asst. chf. sig. engr., Penna., Philadelphia, Pa.
Buchanan, J. P., sig, inspr., N. Y. C., Cleveland, Ohio.
Burkett R. H., div. sig. inspr., C. C. C. & St. L., Springfield, Ohio.
Butridge, J. H., chf. sig. inspr., I. C., Chicago.
Byers, D., inspr., N. Y. C., Cleveland, O.
Caley, G. H., elec. & sig. engr., N. Y. O. & W., Middletown, N. Y.
Carpenter, L. E., sig. engr., Penna., Philadelphia, Pa.
Champlin, E. F., sig. supr., Erie., Elmira, N. Y.
Chappell, G. W., asst. engr., N. Y. N. H. & H., New Haven, Conn.
Christofferson, C. A., sig. engr., Nor. Pac., St. Paul, Minn.
Clough, J. E., supr. sigs., L. & N., LaGrange, Ky.
Combs, H., supr. sigs., L. E. & W., Tipton, Ind.
Cowherd, G. R., sig. engr., E. P. & S. W., El Paso, Texas.
Cronk, C. D., chf. sig. inspr., N. Y. C., West, Cleveland, Ohio.
Cuthbertson, E. A., supr. sigs., Nor. Pac., Tacoma, Wash.
Dawson, W. A., supr. sigs., N. Y. C., Ashtabula, Ohio.
DeMeritt, E. B., sig. engr., Cent. of Ga., Savannah, Ga.
Drake, C., gen. sig. inspr., C. & N. W., Chicago.
Dryden, H. M., sig. supr., B. & O., Dayton, Ohio.
Dryden, W. L., sig. supr., B. & O., St. George, S. I., N. Y.
Duffy, C. M., asst. sig. engr., C. R. I. & P., Des Moines, Ia.
Earheart, C. E., sig. engr., A. & V., Vicksburg, Miss.
Eck, W. J., sig. & elec. supt., Southern, Washington, D. C.
Elliott, W. H., sig. engr., N. Y. C., Albany, N. Y.
Ellis, E. F., supr. sigs., C. C. C. & St. L., Mt. Carmel, Ill.
Elsworth, R. B., asst. sig, engr., N. Y. C., Albany, N. Y.
Falkenstein, O., supr. sigs., T. & O. C., Columbus, Ohio.
Fay, E. supr. sigs., G. T., Belleville, Ont.
Finch, J. C., sig. inspr., Mo. Pac., St. Louis, Mo.
Foale, H. J., sig. engr., Wabash, Decatur, Ill.
Follett, W. F., asst. engr., N. Y. N. H. & H., New Haven, Conn.
Foster, F. C., sig. supr., L. & N, Evansville, Ind.
Frantzen, O., supr. sigs., N. Y. N. H. & H., Boston, Mass
Fugina, A. R., sig. engr., L. & N., Louisville, Ky.
Fuller, D. W., asst. engr., A. T. & S. F., Topeka, Kans.
Gallagher, E. B., sig. inspr., Ill. Cent., Chicago.
Gault, P. M., office engr., I. C., Chicago.
Gensheimer, J. S., sig. inspr., Penna., Pittsburgh, Pa.
Gillan, I. F., sig, supr., C. M. & St. P., Milwaukee, Wis.
Ginty, J. J., supr. sigs., G. T., Montreal, Que.
Goeppert, G. E., asst. sig. supr., D. L. & W., Buffalo, N. Y.
Goings, C. E., sig. engr., Penna., Philadelphia, Pa.
Grant, E. C., supr. sigs., U. P., Denver, Colo.
Haag, H. F., sig. engr., K. C. Sou., Kansas City, Mo.
Hancock, H. P., supr. const., N. & W., Roanoke, Va.
Hanson, E., sig. engr., G. C. & S. F., Galveston, Texas.
Hanson, L. J., supr. sigs., G. T., Montana, Que.
Hartvig, C. E., asst. sig. engr., C. R. I. & P., El Reno, Okla.
Hassel, L. H., asst. sig. supr., N. Y. C., Utica, N. Y.
Hickey, J. H., sig. supr. Sou. Pac., Dunsmuir, Cal.
Himes, A. B., asst. sig. engr., B. & O., Baltimore, Md.
Hixson, C. W., supt. tel. & sigs., Penna., Chicago.
Hobson, H., sig. engr., A. T. & S. F., Topeka, Kans.
Inwood, T. G., sig. supr., N. Y. C., Englewood, Ill.
Jacob., F. E., sig. engr., C. & W. I., Chicago.
Johnson, W. C., gen. sig. supr., C. St. P. M. & O., St. Paul, Minn.
Keirn, L. C., asst. sig. supr., N. Y. C., Chicago.
Kelloway, C. J., supt. sigs., A. C. L., Wilmington, N. C.
Kelly, A. J., sig. supr., C. C. C. & St. L., Indianapolis, Ind.
Kenny, J. L., supr. sigs., G. T., Montreal, Que.
Kilian, H. L., supr. sigs., N. Y. C., Toledo, Ohio.
Kirley, G. A., sig. engr., B. & A., Boston, Mass.
Kydd, G. W., sig. pilot engr., B. & O., Baltimore, Md.
Lamb, J. B., sig. & elec. engr., Southern, Charlotte, N. C.
Latomer, J. B., sig. engr., C. B. & Q., Chicago.
Law, S. W., asst. sig. engr., Nor. Pac., St. Paul, Minn.
Lewis, H. W., sig. engr., L. V., Bethlehem, Pa.
Lowry, H. K., sig. engr., C. R. I. & P., Chicago.
Lynch, N. S., sig. supr., Mo. Pac., Kansas City, Mo.
McCartney, J., chf. clerk, Penna., Philadelphia, Pa.
McCreary, O. L., asst. supt. tel. & sigs., Penna., Chicago.
McKeen, A. H., sig. engr., U. P., Omaha, Nebr.
Massie, J. F., supr. sigs., L. & N., Knoxville, Tenn.
Mock, J. C., sig. & elec. engr., M. C., Detroit, Mich.
Morgan, H. G., sig. engr., I. C., Chicago.
Morphy, L. G., chf. engr., Rutland, Rutland, Vt.
Newman, W. H., sig. supr., N. Y. C., Buffalo, N. Y.
Nutting, A. G., supr. of sigs., Nor Pac., Livingston, Mont.
Oler, B. F., sig. inspr., Penna., Philadelphia, Pa.
Oppelt, J. H., supr. sigs., N. Y. C. & St. L., Cleveland, Ohio.
Orr, J. S., sig. supr., O. S. L., Pocatello, Ida.
Patenall, F. P., sig. engr., B. & O., Baltimore, Md.
Patton, G. J., sig. supr., D. L. & W., East Orange, N. J.
Person, G. H., sig. supr., B. R. & P., Dubois, Pa.
Pflasterer, G. S., sig. engr., N. C. & St. L., Nashville, Tenn.
Phinney, R. M., asst. sig. engr., C. & N. W., Chicago.
Porter, L. B., asst. sig. engr., C. M. & St. P., Milwaukee, Wis.
Post, E. K., sig. engr., Penna., Philadelphia, Pa.
Post, W. M., supt. tel & sigs., Penna., Pittsburgh, Pa.
Ragland, R. R., sig. supr., Mo. Pac., DeSoto, Mo.
Raymer, I. S., sig. engr., P. & L. E., Pittsburgh, Pa.
Relph, E. J., mech. engr. of sigs., Nor. Pac., St. Paul, Minn.
Rice, A. H., sig, engr., D. & H., Albany, N. Y.
Richards, D. W., sig. engr., N. & W., Roanoke, Va.
Robison, H. O., sig. supr., Mo. Pac., Osawatomie, Kans.
Rohner, J. P., asst. sig. supr., Nor. Pac., Tacoma, Wash.
Rowe, C. E., asst. sig. supr., N. Y. C., Elkhart, Ind.
Rudd, A. H., chf. sig. engr., Penna., Philadelphia, Pa.
Saunders, W. K., supr. sigs., R. F. & P., Ashland, Va.
Schroeder, J. M., sig, inspr., N. Y. C. & St. L., Ft. Wayne, Ind.
Schwendt, B. J., supt. tel. & sigs., T. & O. C., Columbus, O.
Scott, W. Y., sig. engr., B. & M., Boston, Mass.
Selke, F. A., sig. supr., C. I. & L., Lafayette, Ind.
Sharpley, H. F., prin. asst. engr., Cent. of Ga., Savannah, Ga.
Sheets, R. S., asst. sig. supr., C. & N. Y., Boone, Ia.
Sicht, John, sig. supr., Mo. Pac., Falls City, Nebr.
Smith, A. M., asst. sig. supr., Erie, Ramsey, N. J.
Smith, E. B., supr. sigs., N. Y. C., New York.
Spangler, D. E., supr. tel. & sigs., Penna., Williamsport, Pa.
Spangler, W. N., asst. supr. tel. & sigs., Penna., Philadelphia, Pa.
Stecher, C. G., sig. instr., C. & N. W., Chicago.
Stephens, C., sig. engr., C. & O., Richmond, Va.
Stevens, T. S., sig. engr., A. T. & S. F., Topeka, Kans.
Stilwell, W. H., sig. supr., L. & N., Paris, Ky.
Stoltz, C. F., sig. engr., C. C. C. & St. L., Cincinnati, Ohio.
Storms, W. S., asst. sig. engr., Erie, New York.
Stradling, E. G., supt. tel. & sigs., C. I. & D., Lafayette, Ind.
Stuart, F. C., sig. engr., E. J. & E., Joliet, Ill.
Stueber, A. A., sig. supr., C. B. & Q., Lincoln, Nebr.
Stump, H. N., supr. tel. & sigs., Penna., Jersey City, N. J.
Sutherland, M. E., sig. engr., Me. Cent., Brunswick, Me.
Swanson, W. W., supr. sigs., C. B. & Q., McCook, Nebr.
Tasker, A. H., supr. tel. & sigs., Penna., Altoona, Pa.
Thomas, G. K., asst. sig. engr. A. T. & S. F., Topeka, Kans.
Tillet, C. H., sig. engr., G. T., Montreal, Que.
Toft, G., supr. tel. & sigs., Penna., Wilmington, Del.
Turner, A. C., sig. supr., Erie, Buffalo, N. Y.
Turner, R. S., sig. supr., U. P., Omaha, Nebr.
Tyler, W., supr. sigs., L. I., Jamaica, N. Y.
Unger, O. R., sig. inspr., Mo. Pac., Kansas City, Mo.
Vallee, A., sig. supr., D. & H., Oenonta, N. Y.
Vandersluis, W. M., engr. secy., Electrification commission, Chicago.
Vernon, J. I., sig. supr., N. Y. N. H. & H., Providence, R. I.
Viellard, L. F., elec. sig. inspr., L. I., Jamaica, N. Y.
Waechtler, W. G., asst. sig. supr., N. Y. C., Kingston, N. Y.
Walter, L. C., sig. & elec. supr., Southern, Washington, D. C.
Weigel, J. B., sig. inspr., L. & N., Louisville, Ky.
Werthmuller, L. S., sig. supr., Mo. Pac., St. Louis, Mo.
Whitcomb, L. L. supr. sigs., N. Y. C., Cleveland, Ohio.
White, A. R., sig. supr., L. A. & S. L., Los Angeles, Cal.
Whitehorn, A. R., sig. inspr., I. C., Chicago.
Wiegand, F. B., sig. engr., N. Y. C., Cleveland, Ohio.
Williams, J. F., sig. supr., C. C. C. & St. L., Galion, Ohio.
Wolslegel, J. W., sig. inspr., D. L. & W., Norwich, N. Y.
Woods, L. D., sig. inspr., Mo. Pac., Little Rock, Ark.
Worthing, E. E., sig. engr., Sou. Pac., Houston, Tex.

Wyley, E., sig. supr., C. B. & Q., Chicago.
Yarrell, A. J., sig. inspr., C. I. & L., Lafayette, Ind.
Yocum, A. H., sig. engr., P. & R., Philadelphia, Pa.
Young, W. R., supt. sigs., G. T., Chicago.

Railroad Affiliated Members

Ackerman, F. J., sig. engr., K. C. Term., Kansas City, Mo.
Clapper, H. D., sig. maint. for., N. Y. C., Knox, Ind.
Cleveland, W. D., sig. supr., Ohau, Honolulu, Hawaii.
Davis, G. S., supr. sigs., P. & R., Harrisburg, Pa.
Falk, C. L., sig. supr., Wabash, Decatur, Ill.
Harris, M. L., supr. sigs., N. & W., Roanoke, Va.
Hodgdon, C. R., sig. engr., Can. Pac., Winnipeg, Man., Canada.
Hyatt, T., sig. supr., Wabash, St. Louis, Mo.
Jacobs, J. F., supr.sigs., Cent. of N. J., Easton, Pa.
Kearton, T. H., sig. supr., C. G. W., Clarion, Ia.
Kearton, W., sig. engr., Minn. R. R. & Warehouse Com., St. Paul, Minn.
Lorenzen, H. C., asst. engr., sig. dept., P. M., Detroit, Mich.
McCusker, W. A., sig. supr., United Rys., Baltimore, Md.
McDonald, J. E., sig. inspr., D. W. & P., Virginia, Minn.
Nicholson, F. L., chf. engr., N. S., Norfolk, Va.
Noble, S. E., sig. draftsman, C. & N. W., Chicago.
Patterson, A. J., supr. of constr., C. & O., Richmond, Va.
Peterson, G. A., office engr., Wabash, Decatur, Ill.
Routledge, T. E., sig. repairman, C. C. C. & St. L., Terre Haute, Ind.
Schubert, J. H., gen. sig. inspr., N. C. & St. L., Nashville, Tenn.
Seeburger, F. F., sig. relay inspr., C. M. & St. P., Tacoma, Wash.
Smith, C., sig. inspr., St. L.-S. F., Springfield, Mo.
Taylor, E. S., asst. sig. engr., Can. Pac., Montreal, Que., Canada.
Trout, G. W., supt. tel. & sig. engr., P. M., Detroit, Mich.
Yewell, J. E., chf. draftsman, B. & L. E., Greenville, Pa.

Affiliated Members

Ahrens, C. R., dist. rep., Chicago Ry. Sig. & Sup. Co., New York.
Allen, W. P., res. mgr., Union Switch & Signal Co., New York.
Ames, Azel, Kerite Ins. Wire & Cable Co., New York.
Arkenburgh, W. H., salesman, Nat. Carbon Co., Schenectady, N. Y.
Atkin, G. H., mgr., Electric Storage Battery Co., Chicago.
Baker, R. N., rep., Central Electric Co., Chicago.
Beaumont, J., v. p. & sales mgr., Regan Safety Device Co., Chicago.
Beck, H. M., engr., Electric Storage Battery Co., Chicago.
Bovard, W. P., designing engr., Ohio Brass Co., Mansfield, Ohio.
Briney, M. R., Eastern mgr., Federal Signal Co., New York.
Brown, E. W., Eastern sales mgr., Thos. A. Edison, Inc., East Orange, N. J.
Cameron, F. C., mgr., Corning Glass Works, Corning, N. Y.
Carter, P. E., res. mgr., General Railway Signal Co., New York.
Cloud, W. D., sales mgr., General Railway Signal Co., New York.
Coleman, J. P., cons. engr., Union Switch & Signal Co., Swissvale, Pa.
Coleman, W. W., Coleman Railway Supply Co., New York.
Collins, M. W., sec. & treas., Maloney Oil Mfg. Co., New York.
Cozzens, J. J., Union Switch & Signal Co., New York.
Curtis, R. H., Peter Gray & Sons, Inc., Boston, Mass.
Day, S. M., prin. asst. engr., General Railway Signal Co., Rochester, N. Y.
Dean, A., Jr., spec. rep., Union Switch & Signal Co., New York.
Deems, E. M., pres. & mgr., Eastern Signal & Supply Co., New York.
Dodgson, F. L., cons, engr., General Railway Signal Co., Rochester, N. Y.
Dunham, L. S., chf. engr., Thos. A. Edison, Inc., Bloomfield, N. J.
Dunn, J. H., associate editor, "Railway Signal Engineer," Chicago.
Edmunds, F. W., gen. eastern sales mgf., Sunbeam Electric Manufacturing Co., New York.
Fox, M. J., rep., Railroad Supply Co., Chicago.
Gage, O. A., sales mgr., Corning Glass Works, Corning, N. Y.
Gillingham, W. J., vice-pres., Hall Switch & Signal Co., Garwood N. J.
Hamilton, J. A., sales rep., Kerite Insulated Wire & Cable Co., Chicago.
Handlan, A. H., Jr., sec., Handlan-Buck Manufacturing Co., St. Louis, Mo.
Handlan, E. R., secy. & treas. Handlan-Buck Manufacturing Co., St. Louis, Mo.
Hayes, S. W., pres., Hayes Track Appliance Co., Richmond, Ind.
Henry, W. S., service engr., General Railway Signal Co., Rochester, N. Y.
Henze, C. D. A., res. mgr., Federal Signal Co., Chicago.
Howard, L. F., chf. engr., Union Switch & Signal Co., Swissvale, Pa.
Howe, W. K., chf. engr., General Railway Signal Co., Rochester, N. Y.
Hyde, P. B., General Battery & Supply Co., Chicago.
Keenan, W. J., vice-pres., Pettingel Andrews Co., Boston, Mass.
Kellenberger, K. E., editor. "Railway Signal Engineer," Chicago.
Kyle, W. T., asst. gen. mgr.-sales, Page Steel & Wire Co., New York.
Lavarack, F. C., gen. sales mgr., Railroad Accessories Co., New York.
Lundy, E. A., business mgr., "Railway Signal Engineer," Chicago.
McCarthy, D. J., chf. engr., Chicago Railway Signal & Supply Co., Carpentersville, Ill.
Mann, L. R., sales engr., R. R. dept., Central Electric Co., St. Louis, Mo.
Manuel, W. N., rep., Corning Glass Works, Corning, N. Y.
Martus, M. L., sec. & mgr., Waterbury Battery Co., Waterbury, Conn.
Miller, P. W., rep., Kerite Insulated Wire & Cable Co., New York.
Miskelly, S., supt., Bryant Zinc Co., Chicago.
Nelson, G. A., spec. rep., Waterbury Battery Co., New York.
Newcomb, E. W., Pac. coast sales mgr., Thos. A. Edison Inc., San Francisco, Cal.
Pope, Mark C., salesman, Electric Storage Battery Co., Washington, D. C.
Pratt, A. E., asst. mgr. R. R. dept., National Carbon Co., Cleveland, Ohio.
Rowland, E. W., Ohio Brass Co., Mansfield, O.
Saunders, J. E., asst. chf. engr., Union Switch & Signal Co., Swissvale, Pa.
Shaver, A. G., consulting engr., Chicago.
Sheene, H. R., res. mgr., Union Switch & Signal Co., St. Louis, Mo.
Spangler, J. M., sales rep., National Carbon Co., Cleveland, Ohio.
Sperry, H. M., pub. rep., U. S. & S. Co., G. R. S. Co., H. S. & S. Co., New York.
Stover, C. R., asst, mgr., National Lamp Works, General Electric Co., Cleveland, Ohio.
Talbert, W. W., res. mgr., Union Switch & Signal Co., Chicago.
Tuttle, R. P., sales engr., Union Switch & Signal Co., New York.
Underhill, J. D., sales mgr., The Okonite Co., Passaic, N. J.
Webb, J. F., Jr., sec.-treas., International Signal Co., New York.
White, F. J., elec. engr., The Okonite Co., New York.
Wight, S. N., comm. engr., General Railway Signal Co., Rochester, N. Y.
Wilson, D. C., asst. sales mgr., Edison Storage Battery Co., New York.
Young, J. W., rep., Kerite Insulated Wire & Cable Co., New York.

Guests

Allen, P. M., engr. draftsman, N. Y. C., Albany.
Bears, A. M., sig. supr., Can. Pac., Winnipeg, Can.
Beoddy, J. A., gen. sig. inspt., N. & W.
Bishop, E. J., asst. engr., L. S. & I.
Botts, A. E., div. engr., C. & O.
Burchett, R. R., supr. track, C. & O., Logan, W. Va.
Cullen, R. J., draftsman, B. & A., Boston, Mass.
Farnkawa, K., elec. engr., Japanese Govt. Rys.
Florence, S. R., sig. engr. Pac. Elec., Los Angeles, Cal.
Fox, Guy W., maint., N. Y. C. & St. L., Hammond, Ind.
Franklin, H. A., insptr., Iowa R. R. Commission.
Greer, sig. maint., Southern, Toteville, Ky.
Haley, J. J., sig. supr., Mo. Pac., Little Rock, Ark.
Hasen, T. C., sig. supr., N. P.
Hishon, W. H., maint., N. Y. C., Indiana Harbor.
Immekes, C., estimator, I. C., Chicago.
Jepson, Olof, sig. for., M. M. & S. E., Marquette, Mich.
Johnson, H. E., sig. inspr., C. & O.
Leonard, Geo. T., sig. supr., G. C. & S. F., Cleburne, Texas.
Lightfoot, L. L., asst. supr. of sigs., N. Y. C., Toledo, Ohio.
McCaulley, C. G., supt., Jacksonville Term. Co., Jacksonville, Fla.
McKithan, R. B., sig. supr., G. C. & S. F.
Mumford, R. W., div. engr., C. & O.
Peet, Wm. H., draftsman, A. T. & S. F., Topeka, Kans.
Penrod, A. J., Jr., B. & O.
Pettus, J. K., asst. engr., N. S.
Prother, L. E., elec. for., C. C. C. & St. L., Springfield, Ohio.
Rice, D. S., supr. sigs., L. V., Sayre, Pa.
Ryan, F. J., supr. sigs., I. C., Freeport, Ill.
Stephenson, sig. engr., Chicago Elevated Rys., Chicago.
Thompson, S. R., supr. sigs., C. & O., Huntington, W. Va.
Thompson, Thos. P., sig. for., M. M. & S. E., Marquette, Mich.
Tocher, Chas. E., chf. sig. draftsman, Mo. Pac., St. Louis, Mo.
Van Etten, F. H., supr., T. T. & S., C. M. & St. P., Terre Haute, Ind.
Watters, H. N., div. engr., C. & O.

Board of Direction Meeting

The Board of Direction of the American Railway Engineering Association met in session at the Congress hotel yesterday to complete the work of the year and to prepare for the convention.

Annual Exhibit of the N. R. A. A. at the Coliseum

"Harding" Blue With White Features Decorative Scheme. All Exhibit Space Taken by 176 Firms

"THE CANOPY MARKS THE ENTRANCE." With these words C. W. Kelly, secretary of the National Railway Appliances Association, concluded his remarks to the writer regarding the annual exhibit of that body which opened at the Coliseum yesterday. By way of the canopy, then, one enters the exhibit area which is located in the Annex and Coliseum, where every available inch of space has been taken up by the 176 exhibiting members at this year's show. The ballroom space has not been utilized, as a result of which it has been necessary in some instances to provide special table space for exhibitors.

The decorative scheme of this year is "Harding" blue with white and is most attractive. The booths are separated by white paneling, edged with "Harding" blue, while the firm names are in green on a white background and here and there the crest of the Association is emblazoned on the paneling. Festoons of yellow material are draped at short intervals across the false ceiling of oatmeal color, which is finished off where it strikes the booths with a flounce of the same material. The "Harding blue" effect is carried out further in the literature and badges.

The four days' attendance is expected to break all previous records, as it will be enlarged this year by the visitors to the March meeting of the Signal Section. Passes have been issued to the number of 13,500 and 75,000 invitations have been sent to railway officers, members of the Interstate Commerce Commission and like bodies, and to technical colleges. As was the case last year, a new record has ben made in tickets requested by railway officers for themselves and subordinates; the number this year is greater than ever before. These facts and the large number of visitors on the first day forecast a record attendance.

Though there will be no band concerts this year, other arrangements will remain about the same as in the past. Public stenographers are in attendance and separate registration booths have been provided on the right as one enters the Annex for the members of the American Railway Bridge and Building Association, the Roadmasters' and Maintenance of Way Association, the Scalesmen's Association and the Signalmen's Association. A first class dining room is in operation at the show and great care has been taken to make the food and service of the best. One can therefore eat on the premises and it will not be necessary to go downtown to get a "regular" meal. The Association will hold its annual meeting in this dining room, which is down the stairs on the east side of the Coliseum, Tuesday morning at 11 o'clock.

The exhibit will be open each day from 8 a. m. to 6:30 p. m., with the exception of Tuesday, when the doors will be open until 11 p. m., and the last day, when they will be closed at 1 p. m.

The officers and members of the board of directors of the National Railway Appliances Association for the past year were: President, G. C. Isbester, American Chain Company, Chicago; vice-president, T. W. Aishton, National Malleable Castings Company, Chicago; secretary-treasurer, C. W. Kelly, Kelly-Derby Company, Chicago; honorary director, J. B. Strong, Ramapo Iron Works, Hillburn, N. Y.; directors, E. A. Johnson, Duff Manufacturing Company, Pittsburgh, Pa.; W. J. Gillingham, Hall Switch & Signal Company, Garwood, N. J.; L. W. Shugg, General Electric Co., Schenectady, N. Y.; A. J. Filkins, Paul Dickinson, Inc., Chicago; A. A. Taylor, Fairbanks-Morse & Co., Chicago; and G. E. Geer, Wyoming Shovel Works, Chicago.

LIST OF EXHIBITORS

The following is a list of firms presenting exhibits, with the devices on display and the names of the representatives present at their booths:

Adams & Westlake Company, The, Chicago.—Signal lamp; lanterns, stop sign; long time burners; switch lock; etc. Represented by A. S. Anderson, F. W. Foehringer, Wm. J. Pierson, Chas. B. Carson, J. F. Stender, H. G. Turney and G. L. Walters. Spaces 87, 88, 106 and 107.

Adams Motor & Manufacturing Company, Chicago.—Gasoline operated motor cars. Represented by W. E. Adams, R. S. Adams, W. M. McClintock and L. Gerhardt. Spaces 218 and 218½.

Air Reduction Sales Company, New York City.—Welding and cutting torches; oxyacetylene welding and supplies; oxygen and acetylene gas. Represented by H. H. Melville. Spaces 167, 167½ and 168.

American Abrasive Metals Company, New York City.—Safety treads. Represented by C. A. Barker. Space 172.

American Car & Foundry Company, Chicago.—Electric rivet heater; electric stock heater. Represented by C. P. Dickerman, A. F. Frost and A. G. Wood. Spaces 203 and 212.

American Chain Company, Inc., Bridgeport, Conn.—Welded-weldless chain; railroad specialties; castings and valves. Represented by W. T. Morris, A. P. Van Schaick, G. C. Isbester, A. H. Weston, R. T. Hatch, J. N. Ferguson, M. L. Chase, W. V. Walsh, G. B. Kutz and J. N. Lee. Spaces 81, 82 and 83.

American Hoist & Derrick Company, St. Paul, Minn.—Railroad ditcher. Represented by Helen M. Hoeller, W. B. Maurer, W. L. Manson, F. J. Johnson and J. L. Hickey. Space 88½.

American Kron Scale Company, New York City.—Automatic dial scales. Represented by Carl F. Larson and Ernst Ohnell. Space 125.

American Malleable Castings Association, Cleveland, Ohio.—Certified malleable castings and tests on same. Represented by Frank J. Lanahan and Eurique Touceda. Spaces 181, 182 and 183.

American Radiator Company, Chicago.—Heating outfits for stations and interlocking towers. Represented by J. H. Davis and W. J. Tuttle. Space 190.

American Steel & Wire Company, Chicago.—Wire rope; electrical wires and cables; rail bonds; trolley wire; fence; steel fence posts; steel gates. Represented by L. P. Shanahan, B. H. Ryder, J. W. Collins, A. R. Waterman, A. W. Froude, M. E. Evans and J. F. Alexander. Spaces 51½ and 52.

American Valve & Meter Company, The., Cincinnati, Ohio.—Water columns; Interlocking switch stand; safety switch lock; switch stands. Represented by J. T. McGarry, D. J. Higgins, F. C. Anderson and J. DePinal. Spaces 130, 131 and 132.

American Vulcanized Fibre Company, Wilmington, Del.—Vulcanized fibre for rail joint; steel tie; switchrod; bridge and hand-car insulation; fibre for mechanical and electrical use. Represented by C. W. Sutton, C. C. Bell, H. C. Hackett and John Barron. Space 126.

Argyle Railway Supply Company, Chicago.—Track devices; motive power; freight car specialties. Represented by George W. Bender and A. H. Green. Space 163½.

Armco Culvert & Flume Manufacturing Association, Middletown, Ohio.—Ingot iron culverts and sheets. Represented by G. F. Ahlbrandt, W. W. Lewis, Fred Melhope, H. L. Harris, H. W. Rinearson and A. B. Reincke. Spaces 99 and 100.

Asphalt Block Pavement Company, Toledo, Ohio.—Compressed asphalt flooring; paving blocks. Represented by E. J. Snyder, Fletcher Rogers and J. B. Weed. Space 166½.

Atkins, E. C., Company, Inc., Indianapolis, Ind.—Saws. Represented by L. L. Okey and E. S. Norvell. Space 219½.

Baker R & L Company, Cleveland, Ohio.—Crane truck; elevating platform truck; 3-wheel tractor. Represented by T. W. Barnes. Space 225.

Balkwill Manganese Crossing Company, The, Cleveland, Ohio.—Articulated cast manganese railroad crossings. Represented by Stephen Balkwill. Spaces 201 and 202.

Barrett Company, The, New York City.—Roofing; waterproofing for bridges and building foundations; tunnels and reservoirs;

wood preserving; road beds. Represented by William S. Babcock and Carl T. Bilyea. Spaces 107½ and 108.

Barrett Cravens Company, Chicago.—Lift trucks; portable floor crane; industrial tractor; steeleg platforms. Represented by Edwin J. Heimer, C. E. Martin and A. M. Barrett. Space 14.

Bethlehem Steel Company, Bethlehem, Pa.—Switch stands; solid manganese tongue switches and mates; manard frogs. Represented by N. E. Salisch, G. S. Vickery, Fred Weymouth, B. W. Barnwell, Marshall Carroll, Harry Weymouth, G. H. Riddle, E. B. C. Goyne and J. S. Clark. Spaces 118, 119, 137 and 138.

Blaw-Knox Company, Pittsburgh, Pa.—Clam shell buckets; handy houses. Represented by Irving G. Jackson, R. D. Allrich, R. B. Randall, I. A. Pfeil, W. H. Schutte, J. H. Flynn and C. H. Lehman. Space 89.

Boss Nut Company, Chicago.—Lock nuts; bolts; rivets and track bolts. Represented by J. A. MacLean, J. W. Fogg, J. P. Crowley, A. W. MacLean, W. G Willcoxson, E. T. McAuliffe and C. Beaumont. Spaces 1 and 2.

L. S. Brach Manufacturing Company. Newark, N. J.—Lightning arresters and signal accessories. Represented by G. Gort and L. S. Brach. Space 3.

Brown Hoisting Machinery Company, The, Cleveland, Ohio.—Locomotive cranes; car dumpers; buckets; boat unloaders. Represented by Geo. F. Climo, J. P. Case and R. L. Meade. Space 4.

Bryant Zinc Company, Chicago.—Railway signal supplies. Represented by S. C. Bryant. Spaces 154 and 155.

Bucyrus Company, South Milwaukee, Wis.—Spreader plows; wrecking cranes; excavating machinery. Represented by Mark J. Woodhull. Spaces 213 and 214.

Buda Company, The, Chicago.—Motor cars; power car with tie tampers and electric bond drill and wood drill; electric headlight; all steel bumping post; switch stand; power unit; jacks; tool grinder; electric crossing gate; car replacers; rolled steel motor car; hand and push car wheels; track drill; bonding drill; track level; track gauge. Represented by L. M. Viles, F. E. Place, R. B. Fisher, C. H. Bull, M. H. Harkless, J. B. Conant, E. J. Conant, E. D. Conant, J. J. Gard, H. M. Sloan, H. L. Miller, C. T. Miller, J. R. Mayeskie, C. N. Bradley, M. A. Ross, W. P. Hunt, H. P. Bayley, G. E. Bryar, J. L. Artmaier, M. A. Evans, G. W. Hoover, J. E. Murray, F. R. Taggart and Wm. S. Weston. Spaces 61, 62, 63, 64 and 65.

Carbic Manufacturing Company, New York City.—Portable lights; motor car lights; welding and cutting outfits; acetylene generators. Represented by D. C. Duncan, A. D. Guthrie, Gordon Paterson and C. H. Bolinder. Space 15.

Carter Bloxonend Flooring Company, Chicago.—Flooring. Represented by M. G. Truman, C. J. Carter, R. G. Stowell, A. B. McHenry, J. G. Galvin and F. L. Bronez. Space 219.

General Electric Company, Chicago.—Wires; cables; tape; lighting units; receptacles; plugs. Represented by A. L. McNeil, J. M. Lorenz, L. R. Mann, E. H. McNeil and R. N. Baker. Space 17.

Challenge Company, Batavia, Ill.—Complete working model of steel structure; 50,000-gallon tank with railroad fixtures. Represented by Frank Snow, E. W. Johnson, J. A. Anderson, D. C. Harker and R. L. Lewis. Space 109.

Chicago Bridge & Iron Works, Chicago.—Conical bottom and elliptical bottom; elevated locomotive water tanks; non-freeze spout fixtures. Represented by Merle J. Trees, H. C. Brown, L. McDonald, J. L. Zeller, H. B. Murphy, Ralph Green, R. M. Campbell, K. I. Small, Wallace Wyman, J. R. Donaldson, C. H. Scheman, C. S. Sangdahl, E. E. Alt, Clint M. Ladd and Cedric B. Smith. Spaces 33 and 34.

Chicago Malleable Castings Company, Chicago.—Two-way rail anchors; rail anchor tie plates. Represented by J. S. Llewellyn, Warren Osborn, W. L. Beaudway, G. B. Greene, Geo. W. Stevens, A. R. Anderson and Wattern Osborn. Space 142.

Chicago Pneumatic Tool Company, Chicago.—Electric and pneumatic appliances for track work. Represented by H. G. Barlee, A. Andresen, H. S. Rumsey, N. S. Thulin and John D. Crowley. Spaces 200 and 215.

Chicago Railway Signal & Supply Company, Chicago.—Signaling apparatus. Represented by E. W. Vogel, A. C. Dunne, R. S. Frehse, A. E. Ferguson, John S. O'Fallon, Sidney Johnson, C. R. Ahrense, D. J. McCarthy, Wm. C. McClintock and C. A. Suhr. Spaces 77 and 79.

Chipman Chemical Engineering Company, Inc., New York City.—Chemical weed killer and equipment for application of chemical. Represented by R. N. Chipman, R. B. Davis and M. McComb. Space 90½.

Cleveland Railway Supply Company, The, Cleveland, Ohio.—Switch stands; guard rails; foot guards; flangeway guards; tie plates; rail braces; washers; cranes. Represented by F. A. Peck, W. N. Neeson, A. W. Winsor and C. E. Cary. Space 133.

Creepcheck Company, Inc., The, Hoboken, N. J.—Rail anchors. Represented by P. E. Browne, John T. Reagan and Ray Dinklage. Space 5.

Crerar, Adams & Co., Chicago.—Track tools; jacks; track drills; rail saws; bonding drills. Represented by G. D. Bassett, J. A. Martin, Ed Mahlke, W. I. Clock, E. C. Poehler, C. W. Gregory, Russell Wallace and R. M. Bullard. Space 28.

Delco Light Company, Dayton, Ohio.—Light plants. Represented by J. A. Harlan. Space 7.

Detroit Graphite Company, Detroit, Mich.—Paints. Represented by T. R. Wyles, L. D. Mitchell, H. I. Miller, W. D. Waugh, C. A. Nye, J. R. C. Hintz, L. F. Flanagan and E. Booth. Space 108½.

Detroit Steel Products Company, Detroit, Mich.—Steel sash; sidewall sash. Represented by R. S. Bishop, Geo. P. Clagson, R. E. Tackaberg and H. C. Bruce. Space 166.

Diamond State Fibre Company, Bridgeport, Pa.—Methods in miniature of the manufacture of fibre insulation. Represented by G. Swallow, J. B. Rittenhouse and C. J. Simmons. Space 51.

Paul Dickinson, Inc., Chicago.—Jacks; chimneys; roof ventilators; model engine house. Represented by K. E. Cates, J. Brand, H. Knutson and A. J. Filkins. Space 98.

Dilworth, Porter & Co., Inc., Pittsburgh, Pa.—Spikes; tie plates. Represented by W. F. Schleiter and Joseph Dilworth. Space 27.

Direct Sales Company, The, Chicago.—Dry cell battery; carbon brushes; dry graphite; graphite lubricants; graphite paints; commutator stones; safety switches. Represented by Walter R. Pflasterer, Chas. S. Pflasterer, Chas. A. Robinson, C. P. Diebel and J. G. Drought. Space 156.

Doty Business Machines Company, Chicago.—Record calculating machines. Represented by Henry H. Doty, Henry F. Doty, A. C. Morgan, R. K. Buckman and E. H. Spencer. Space 164.

Duff Manufacturing Company, Pittsburgh, Pa.—Track jacks; car jacks; locomotive jacks; journal jacks. Represented by E. A. Johnson, C. N. Thulin, G. E. Watts, C. A. Methfessel, G. E. Anderson and W. G. Robb. Space 89½.

Edison, Inc., Thomas A., Bloomfield, N. J.—Batteries for signal and switch lighting; aligning instruments. Represented by L. W. McChesney, R. E. Trout, A. J. Loughren, L. S. Dunham, P. A. Garrity, E. W. Newcomb, E. W. Brown, B. F. Hines, F. S. Stallknecht and R. J. Frost. Spaces 18 and 19.

Edison Storage Battery Company, Orange, N. J.—Storage batteries; car lighting and signaling. Represented by D. C. Wilson. Space 20.

Electric Storage Battery Company, Philadelphia, Pa.—Storage batteries; floating systems for signals; highway crossing signal operations. Represented by Godfrey H. Atkin, Harry B. Marshall, H. B. Crantford, H. M. Beck, Stuart J. Dewey, Paul M. Etters and T. Milton. Space 60.

Elwell-Parker Electric Company, Chicago.—Heavy duty shop crane; elevating truck; heavy duty 3-wheel tractor. Represented by Joseph M. Brown, L. C. Brown and G. W. Brown. Spaces 226 and 227.

Engineering & Contracting, Chicago.—Copies of Engineering & Contracting Magazine. Represented by Lewis S. Louer, Robert W. Hume and Chas. T. Murray. Space 165.

Eymon Crossing Company, The.—Marion, Ohio.—Continuous-rail crossing; cast manganese continuous rail. Represented by Byron E. Wilson, G. T. Wiswell, A. C. Queen and J. H. Eymon. Space 169½.

Fairbanks, Morse & Co., Chicago.—Gasoline motor cars; standpipe; type Y oil engine; scale beam; centrifugal pumps; electric motors. Reprsented by A. A. Taylor, F. M. Condit, J. L. Jones, E. E. Pendray, L. H. Matthews, B. S. Spaulding, E. C. Golladay, F. J. Lee, D. K. Lee, H. E. Vogel, R. F. Lane, E. J. Coverdale, E. M. Underwood, W. F. Anderson, E. J. Davidson, F. D. Drinker, J. C. Flanagan, J. T. Frame, P. H. Gilleland, H. L. Hilleary, K. Jurgensen, G. W. Lewis, Stephen Smith, F. N. Whitesell, M. O. Southworth, S. G. Eaton, C. G. Mahana and H. E. Thompson. Spaces 73, 74, 75, 76, 92, 93, 94 and 95.

Fairmont Gas Engine & Railway Motor Car Company, Fairmont, Minn.—Motor cars; engines and wheels; inspection cars. Represented by H. E. Wade, W. F. Kasper, W. D. Brooks and J. P. Dunning. Spaces 41, 42 and 43.

Federal Electric Company, Chicago.—Electric lanterns; recharge batteries; renewable fuses; renewable fuse plugs; multiphase renewable fuses; electric sirens; charging rack for lantern storage batteries. Represented by F. T. Baird, R. E. Powell, H. W. Neal, E. D. Porges, O. S. Burke and J. W. Curran. Space 169.

Federal Signal Company, Albany, N. Y.—Audible signal; switch circuit controller; direct current relays; alternating current relays; electric interlocking; electric switch machine; interlocked circuit controllers; automatic signal. Represented by A. H. Renshaw, Paul Renshaw, M. R. Briney, Carl Henze, H. C. Ware, J. J. Hubbard, J. F. Kelley and S. J. Turreff. Spaces 47 and 48.

H. K. Ferguson Company, The, New York City.—Gap crane for locomotive shops; standard round house. Represented by H. K. Ferguson, H. S. Jacoby and K. C. Ferguson. Spaces 152 and 153.

Flannery Bolt Company, Pittsburgh, Pa.—Nuts and grease cups. Represented by E. S. Fitzsimmons and Wm. M. Wilson. Space 90.

T. W. Aishton, Vice-President
E. A. Johnson, Director
A. A. Taylor, Director
A. J. Filkins, Director
J. B. Strong, Honorary Director
G. C. Isbester, President
C. W. Kelly, Secretary-Treasurer
L. W. Shugg, Director
G. E. Geer, Director
W. J. Gillingham, Director

Frog, Switch & Manufacturing Company, The, Carlisle, Pa.—Manganese insert frogs; spring rail frogs. Represented by L. E. Weidman, A. Gordon Jones and T. B. Kennedy, Jr. Spaces 52½ and 53.

General Automatic Scale Company, The, St. Louis, Mo.—Heavy duty automatic weighing devices. Represented by W. F. Siegmund, H. L. Price and E. D. Gordon. Space 134.

General Electric Company, Schenectady, N. Y.—Semi-automatic arc welding; headlight sets; lamps. Represented by J. Roberts, C. C. Bailey, H. M. Jacobs, L. W. Shugg, W. M. Brady and C. Dorticos. Spaces 31, 32 and 33.

General Railway Signal Company, Rochester, N. Y.—Low voltage signal; color light signal; electric interlocking lever and lock; relays; clockwork release; desk controller, etc. Represented by M. Wuerpel, F. W. Moffett, W. K. Howe, F. L. Dodgson, W. S. Henry, S. N. Wight, P. E. Carter, L. Thomas, C. M. Deardorff, J. R. Wills, J. A. Geneser, W. H. Workman and H. W. Lucia. Spaces 49 and 50.

Gosso Company, The, Chicago.—Beds. Represented by A. E. Gosso, A. B. Brunker, Thos. Harned, Jr., and L. Jensen. Space 188.

Graver Corporation, East Chicago, Ind.—Water softener. Represented by W. R. Toppan and J. J. Felsecker. Spaces 96 and 97.

Gurley, W. & L. E., Troy, N. Y.—Engineering and surveying instruments; hydraulic engineering instruments, including transits, levels, alidades, compasses, rods, current meters, water stage registers, etc. Represented by H. M. Dibert and C. H. Smart. Space 69½.

Hall Switch & Signal Company, Garwood, N. J.—Color light signals; motor signals; relays; switch controllers and selectors. Represented by H. W. Wolff, W. J. Gillingham, H. L. Hollister, O. S. Field, T. J. O'Meara, J. C. Donaldon and D. R. Day. Spaces 85 and 86.

Hayes Track Appliance Company, Richmond, Ind.—Derails. Represented by R. H. Gausepohl, S. W. Hayes, L. S. Hillman, H. H. Jenkins, J. C. Lowry, H. J. Mayer and F. C. Stowell. Spaces 140 and 141.

Hazard Manufacturing Company, Chicago.—Insulated wires and cables. Represented by W. S. Hart, H. B. Pflasterer, T. A. Keefe and Sidney Johnson. Spaces 21 and 22.

Headley Good Roads Company, Philadelphia, Pa.—Railroad crossings. Represented by F. X. Kern. Spaces 158 and 158½.

Highland Iron & Steel Company, Chicago.—Common and refined iron. Represented by W. C. Wolfe and E. J. Murray. Spaces 81, 82 and 83.

Howlett Construction Company, Moline, Ill.—Electric automatic hoist for coaling station; blue prints and photographs coaling stations. Represented by W. E. Howlett and S. M. Howlett. Space 187.

Hubbard & Company, Pittsburgh, Pa.—Railroad track tools; shovels; scoops. Represented by J. V. Smith, W. H. Remmel, S. F. Remmel and O. W. Youngquist. Space 143.

Illinois Steel Company, Chicago.—Rolled steel wheel; spikes; track spikes; screw bolts; track angle bars and joints. Represented by C. B. Friday, O. H. Baker, P. A. Selby, C. R. Moffatt, J. A. McCree, B. T. Wherry and R. G. Glass. Spaces 70½ and 71.

Ingersoll-Rand Company, New York City.—Air operated labor saving tools used in track and bridge construction and maintenance. Represented by W. H. Armstrong, J. N. Thorp, Jr., Chas. Dougherty, J. P. Gillies and Chas. W. Melcher. Spaces 206 and 209.

Johns-Manville, Inc., New York City.—Asbestos roofing, shingles, transite smoke jacks; industrial flooring; electrical materials; asbestos pipe and boiler insulations; piston packings. Represented by J. E. Meek, J. C. Younglove, G. A. Nicol, P. C. Jacobs, P. R. Austin, C. D. Biggerstaff, W. R. Bush, C. S. Clingman, E. E. Colburn, E. L. Colopy, George Christenson, H. J. Crowe, F. W. Doty, H. Flannagan, C. D. Folsom, R. A. Hamaker, W. J. Hennessy, F. J. Horne, J. D. Johnson, B. J. Jordan, M. S. Kelly, W. H. Lawrence, H. L. Leach, A. H. Purdom, C. E. Murphy, H. G. Newman, C. M. Patten, B. J. Queen, H. B. Sewell, R. C. Simmons, A. C. Towne, J. H. Trent, F. B. Walker and L. S. Wilbur. Spaces 174, 175, 176 and 177.

Jordan, O. F., Company, East Chicago, Ind.—Spreader; ditcher model and photographs. Represented by A. L. Greenabaum, Alfred Jones, Carl J. Nelson, A. E. Wahlstrom, Ray Cosgrove and A. W. Banton. Spaces 56 and 57.

Kalamazoo Railway Supply Company, Kalamazoo, Mich.—Motor cars; steel cattle guards; gauges; levels; track drills; Ford outfits. Represented by J. McKinnon, Frank E. McAllister, D. A. Stewart, W. E. Winterle, H. R. Miller, W. D. Achuff, E. G. Powell and O. P. Lamoreux. Spaces 8, 8½, 23, 24 and 25.

Kaustine Company, Inc., Buffalo, N. Y.—Waterless toilets; toilet partitions and iron septic tanks. Represented by D. A. Evans and representatives Kelly-Derby Company as below. Space 29.

Kelly-Derby Company, Chicago.—Warehouse equipment; trucks; pumps; jacks. Represented by C. W. Kelly, C. F. Snale, D. A. Evans, C. B. Semple, L. S. Johnston, W. H. C. Strecklow, W. H. Diamond and R. C. Higgins. Space 30.

Kentucky Rock Asphalt Company, Louisville, Ky.—Rock asphalt for surfacing roadways, crossings, station platforms, shop floors, etc. Represented by W. H. Tarvin, Wallace L. Caldwell and W. F. Pollard. Space 161½.

Kerite Insulated Wire & Cable Company, Inc., The, New York City.—Insulated wire; cable. Represented by B. L. Winchell, Jr., Azel Ames, P. W. Miller, J. W. Young, J. A. Renton, E. L. Adams, C. A. Reeb, W. H. Fenley and J. A. Hamilton. Spaces 68 and 69.

Keuffel & Esser Company, New York City.—Surveying instruments; measuring tapes; slide rules; drawing instruments and drawing materials. Represented by J. J. Carlisle, Edgar R. Lathrop, H. F. Andrews and J. J. Burggraf. Space 40.

Keystone Grinder & Manufacturing Company, Pittsburgh, Pa.—Railroad tool grinders. Represented by S. S. Newman and L. J. Cooney. Space 193.

Kilbourne & Jacobs Manufacturing Company, The, Columbus, Ohio.—Photographs of all steel automatic air dump cars. Represented by J. N. Markel and Jess Mossgrove. Space 45.

Koehring Company, Milwaukee, Wis.—Concrete mixer equipped with water tank; batch meter; power charging skip. Represented by K. H. Talbot, W. E. Hughes and G. E. Hillsman. Spaces 207 and 208.

L & R Culvert Company, Chicago.—Cast iron culverts. Represented by T. F. Lundergan and R. F. Repasz. Space 192½.

Lehon Company, The, Chicago.—Roll roofing; asphalt shingles; waterproof and insulating papers; asphalt paints and cements; roofing; sill covering; car seal; refrigerator car compound; waterproofing membranes and burlap; waterproofing compounds; asphalt specialties. Represented by Tom Lehon, John Eipper, Charles Jung and E. Franklin. Space 91.

Lorain Steel Company, Chicago.—Switches; frogs; switch stands; special track work. Represented by Carrol Burbon, A. S. Littlefield, S. P. McGough, S. J. Catsworth, W. W. Kingston, J. C. More, E. B. Entwisle and H. C. Stiff. Spaces 204, 205, 210 and 211.

Lufkin Rule Company, The, Saginaw, Mich.—Measuring tapes; wood and steel rules; mechanics' tools. Represented by Robert M. Benjamin, Theo. P. Young and George C. McBeth. Space 121.

Lundie Engineering Corporation, The, New York City.—Tie plates; duplex rail anchors. Represented by John Lundie, L. B. Armstrong, W. S. Boyce, W. Brooke Moore and Eugene Brandies. Space 70.

M. W. Supply Company, Philadelphia, Pa.—Rail benders; switch heaters and guard rail fastenings. Represented by Chas. Z. Vaughan. Space 101.

MacRae's Blue Book Company, Chicago.—MacRae's Blue Book. Represented by Albert MacRae, Thos. H. MacRae, L. R. Rollins, L. Simonson, C. Hill, F. O. Rice, G. M. Hamilton, J. A. Walsh, R. S. Jaquith, H. Deeming, W. F. Miller, D. N. Peirce, F. L. McCabe and R. S. Lundy. Space 9½.

Magnetic Signal Company, Los Angeles, Cal.—Three position magnetic flagman; two position magnetic flagman; simplex relay. Represented by H. W. Renick. Space 165½.

Maintenance Equipment Company, Chicago.—Power ballast screen; rail laying machinery; shovels; friction car stop; derail; switchpoint straightener; steel fence posts; tie spacer. Represented by H. C. Holloway, J. A. Roche and E. Overmier. Spaces 194 and 195.

Massey Concrete Products Corporation, Chicago.—Battery receptacles for signal work; concrete telephone booths; reinforced concrete pipe; concrete poles. Represented by C. Gilman, G. H. Redding, D. A. Hultgren, J. A. Higgs, C. H. Hunsaker, P. E. Longstreet, P. Kircher, W. L. McDaniel and D. B. Hanna. Spaces 54 and 55.

McGraw-Hill Company, Inc., New York City.—McGraw-Hill publications. Represented by Wm. Buxman, F. G. Hudson, E. E. R. Tratman and W. W. DeBerard. Space 185½.

Mechanical Manufacturing Company, The, Chicago.—Bumping posts. Represented by H. E. Johnson and H. C. Huggins. Space 172½.

Metal & Thermit Corporation, New York City.—Welding appliances and rails; welded frogs. Represented by Henry S. Mann and Wm. H. Moore. Space 6.

Metzler, George H., Halifax, Canada.—Portable train stop. Represented by George H. Metzler. Table space.

Midvale Steel & Ordnance Company, Cambria Steel Company, Philadelphia, Pa.—Historical photographs of Cambria plant; rail sections and examples of unusual hogging chips cut from armor plate with high speed steel tools. Represented by J. C. Holding, Stuart Hazlewood, Ward A. Miller and George A. Richardson. Spaces 71½ and 72.

Miller Train Control Corporation, Danville, Ill.—Instrument attached to engineer's running brake valve; shoe, housing and connections mounted on table. Represented by H. B. Miller, W. B. Murray, Eugene Murray, E. E. Murray and P. E. Herren. Spaces 197 and 197½.

Milwaukee Tank Works, Milwaukee, Wis.—Gasoline and oil equipment for section houses; oil warehouses and shops. Represented by Leo Davis and W. C. Gibson. Space 220.

Minwax Company, Inc., New York City.—Waterproofing materials. Represented by A. S. Harrison. Table space.

Morden Frog & Crossing Works, Chicago.—Switches; manganese steel frogs; steel yard frog with adjustable blocks; automatic ground throw switch stand; guard rail clamps; switch adjustments; rail braces; slide plates; open side sockets. Represented by W. J. Morden, Joseph Karcher, B. T. Gibbs, George Killmer, W. H. Hartz and H. Macke. Spaces 199 and 216.

Mudge & Co., Chicago.—Motor cars; combination trailer and push cars; pressed steel wheels. Represented by Burton Mudge, Robert D. Sinclair, Karl J. Eklund, H. W. Cutshall, E. R. Borden, J. M. Mulholland, J. K. Vanatta, C. P. Benning, L. O. Stratton and A. L. Pearson. Space 127.

National Boiler Washing Company of Illinois, Chicago.—Steromotographs. Represented by Spencer Otis, Frederick A. Gale, John S. Maurer, J. M. Weir, T. G. Dalton, F. S. Wichman and F. W. Gale. Space 12.

National Carbon Company, Inc., Cleveland, Ohio.—Caustic soda; cells; carbon products. Represented by J. M. Spangler, A. E. Pratt, W. H. Arkenburgh, D. H. Green, P. G. Pendorf, J. S. Gemmell, R. J. Cox and W. A. Sisler. Spaces 150, 150½ and 151.

National Lead Company, New York City.—White lead; red lead and linseed oil. Represented by A. H. Sabin, W. B. Carlyle, R. Hasse, L. C. Ryan, W. H. Kofmehl, H. W. Schulze, A. N. Lucas, R. Rivett and Wm. Hogan. Spaces 10 and 11.

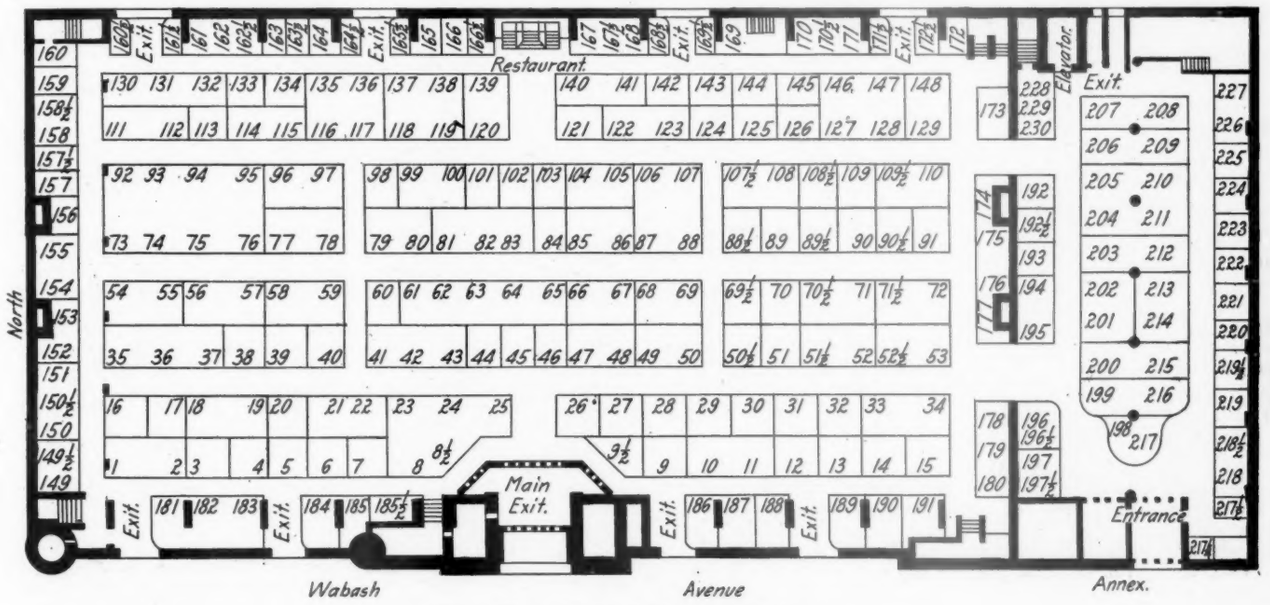
P. & M. Company, The, Chicago.—Rail anti-creepers or rail anchors, and bond wire protectors. Represented by F. A. Poor, Philip W. Moore, Fred A. Preston, Fred N. Baylies, D. T. Hallberg, H. G. Warr, S. M. Clancy, T. J. Byrne, John J. Gallagher, Frank N. Gray, Royal D. Hawley, George E. Johnson, J. E. Mahoney, William A. Maxwell, George E. Olson, William H. Reeves, P. V. Samuelson, L. S. Walker, Perry H. Hamilton and John Ritchie. Spaces 122 and 123.

Page Steel and Wire Company, Bridgeport, Conn.—Welding rods and electrodes; galvanized wire; track bonds, signal and telegraph wire. Represented by W. T. Kyle, C. A. McCune, E. J. Flood and W. A. Berner. Space 84.

Patterson, W. W., Company, Pittsburgh, Pa.—Tackle blocks. Represented by W. W. Patterson, Jr. Space 145.

Pittsburgh-Des Moines Steel Company, Pittsburgh, Pa.—Steel tanks. Represented by Messrs. A. C. Pearsall, H. W. Smith, J. E. O'Leary, O. D. DeHart, I. A. Bickelhaupt, M. P. Cogswell, W. A. DaLee and Max Whitacre. Space 157.

Pocket List of Railroad Officials, The, New York City.—Pocket List of Railroad Officials. Represented by J. Alexander Brown, Harold A. Brown and Charles L. Dinsmore. Space 26.



Floor Plan of the Coliseum and Annex

E. Wallace, F. A. Gregory, Jr., F. M. Hartley, Jr., W. B. Schofield, Chas. Haws and S. V. Van Riper. Space 9.

National Lock Washer Company, The, Newark, N. J.—Nut locks. Represented by J. Howard Horn, F. B. Archibald, A. T. Thompson, R. L. Cairncross, James J. Crawford, R. B. Cardozo and C. C. Washer. Space 192.

National Malleable Castings Company, Cleveland, Ohio.—Wrecking hooks; rail braces; tie plates; bridge washers and spools. Represented by T. W. Aishton, R. W. Chambers, G. A. Faitz, C. H. Krakau, G. R. Rasmussen and L. S. Wright. Space 102.

Nichols, Geo. P., & Bro., Chicago.—Electric turntable tractor; model of electric transfer table. Represented by S. F. Nichols, N. Fries and G. M. Shearer. Space 173.

North Western Motor Company, Eau Claire, Wis.—Motor cars and engines. Represented by F. W. Anderson, A. H. Nelson and R. R. Rosholt. Space 196.

Ogle Construction Company, Chicago.—Model of concrete coaling station, with ground storage and reclaiming equipment in connection. Represented by C. F. Bledsoe, M. W. Powell and J. G. Forster. Space 157½.

Okonite Company, The, Passaic, N. J.—Insulated wires and cables; insulating tapes. Represented by F. Cazenove Jones, Lewis G. Martin, J. Delmar Underhill, Francis J. White and W. R. Van Steenburgh. Space 16.

O'Malley-Beare Valve Company, Chicago.—Globe, angle and check valves; blow-off cocks; locomotive valves; locomotive and car brasses. Represented by Thomas O'Malley, Edward O'Malley, J. N. Gallagher, J. M. Pigott, Walter Morris and J. E. Brown. Spaces 114 and 115.

Oxweld Railroad Service Company, The, Chicago.—Welding and cutting equipment; welded frogs; switch points; battered rail joints and track tools. Represented by G. M. Crownover, F. C.

Portland Cement Association, Chicago.—Railway uses of concrete. Represented by D. A. Tomlinson, A. C. Sydell and J. A. Dunn. Space 217½.

Positive Rail Anchor Company, Marion, Ind.—Guard rail plates and fastenings; rail braces; tie plates; rail anchors; wire rope clips. Represented by A. H. Told, E. A. LeBeau, L. C. Ferguson and J. T. Gelder. Spaces 178, 179 and 180.

Pyrene Manufacturing Company, Inc., New York City.—Hand fire extinguishers; chemical engines; gas masks; safety devices: safety cleaner. Represented by G. P. Rogers, J. P. Maloney and C. A. Ragland. Space 186.

Q & C Company, The, New York City.—Derails; compromise joints; bonzano joints; insulated joints; guard rail clamps; target stands; rail braces; car and engine replacers; replacer clamps; snow melters; switch stands. Represented by R. J. McComb, E. R. Packer, L. T. Burwell, Lewis Thomas, E. M. Smith, J. L. Terry, F. F. Kister and C. F. Quincy. Spaces 120 and 139.

Rail Joint Company, The, Chicago.—Rail joints; continuous, compromise and frog and switch joints. Represented by V. C. Armstrong, J. C. Barr, B. G. Braine, E. A. Condit, Jr., Alex Chapman, C. A. Disbrow, J. A. Greer, C. B. Griffin, H. C. Hickey, Chas. Jenkinson, G. H. Larson, Milton Markley, J. N. Meade, J. G. Miller, R. W. Payne, F. C. Runyon, Thomas Ryan, R. R. Seward, E. F. Schermerhorn, McLeod Thomson, F. C. Webb, G. T. Willard, Benj. Wolhaupter, D. P. Wolhaupter and W. P. Thomson. Spaces 79 and 80.

Railroad Accessories Corporation, New York City.—Steel signal blades; power rail drilling machines; channel pins; bonds; lightning arresters; electric brackets. Represented by F. C. Lavarack and E. M. Deems. Space 184.

Railroad Herald, The, Atlanta, Ga.—Reception booth. Represented by E. C. Laird. Space 161½.

Railway Purchases & Stores, Chicago.—Publications. Represented by Edward J. Wray. Space 163.

Railroad Supply Company, The, Chicago.—Tie plates; derailers; wig wags; bell signals; relays; time element and car counter; compensating coils for relays; channel pins; lightning arresters; meters; etc. Represented by E. H. Bell, Paul W. Kohnen, H. M. Buck, T. B. Bowman, A. H. Smith, G. W. Nibbe, H. G. Van Nostrand, M. J. Fox, F. M. Hill, R. E. Bell, G. M. Kenyon, F. C. Webb, T. W. Nicholson and Geo. J. Schmitt, Jr. Spaces 104 and 105.

Railway Review, The, Chicago.—Railway Review, publications. Represented by Harold A. Smith, A. E. Hoover, J. E. Gougeon, Chas. L. Bates, C. H. Gertner and W. M. Camp. Space 44.

Ramapo Iron Works, Hillburn, N. Y.—Crossings; switch stands; manganese reinforced flange frogs; manganese reinforced switch point; double shoulder solid bottom switch slide plates; switch heel plates; guard rail clamps; adjustable rail braces. Represented by Thomas E. Akers, J. Edgar Davidson, R. J. Davidson, Jr., W. C. Kidd, Douglas E. Snow, John B. Snow, William W. Snow and James B. Strong. Spaces 109½ and 110.

Rawls Machine & Manufacturing Company, Chicago.—Track mower. Represented by S. E. Rawls, S. F. Francks, R. King and W. C. Irwin. Spaces 161, 162 and 162½.

Raymond Concrete Pile Company, Chicago.—Operating model of pile driver driving concrete piles; concrete piles and composite piles. Represented by H. D. Raymond, E. D. Watt, A. C. Everham and A. E. Cummings. Space 188.

Reade Manufacturing Company, Jersey City, N. J.—Equipment in operation showing the distribution of weed exterminator by the spray method. Represented by W. L. Geggus, R. C. Robins and R. H. Bogle. Spaces 228, 229 and 230.

Reliance Manufacturing Company, The, Massillon, Ohio.—Nut locks. Represented by H. C. Mull and H. J. McGinn. Space 221.

Richards-Wilcox Manufacturing Company, Aurora, Ill.—Door hardware for engine houses and car repair shops; door hangers; overway conveying systems. Represented by A. J. Eggleston, E. J. G. Phillips, A. J. LaFluer, J. H. Wise and T. G. Perry. Spaces 170, 170½ and 171.

Roberts, Geo. T., Company, The, Dayton, Ohio.—Miniature railroad water treating system in operation. Represented by John C. Jamieson. Spaces 160 and 160½.

Sellers Manufacturing Company, Chicago.—Anchor bottom wrought iron tie plates. Represented by J. M. Sellers, G. M. Hogan, R. A. VanHouten, T. D. Crowley and R. J. Platt. Space 124.

Sherwin-Williams Company, The, Cleveland, Ohio.—Paints. Represented by P. L. Maury, R. V. Goodremont and W. F. Gallinger. Space 13.

Signal Accessories Corporation, Utica, N. Y.—Directional track instrument; switch point adjusters; signal blades; pipe carrier tops; screw locks; rail braces; foundation extensions; signal blade cleaners; terminals; lamp blocks. Represented by Wm. F. *Bossert, Sidney* G. Johnson and O. S. Flath. Space 113.

Simmons-Boardman Publishing Company, Chicago.—Railway publications, Railway Age; Railway Maintenance Engineer; Railway Signal Engineer; Railway Mechanical Engineer; Railway Electrical Engineer; Maintenance of Way Cyclopedia; Boiler Maker; Marine Engineering. Represented by L. B. Sherman, Henry Lee, F. H. Thompson, F. C. Koch, R. F. Duysters, J. M. Rutherford, B. J. Wilson, E. A. Lundy, Samuel O. Dunn, E. T. Howson, W. S. Lacher, K. E. Kellenberger, Milburn Moore, C. B. Peck, J. E. Cole, J. H. Dunn, Homer Beach, W. F. Rench and D. A. Steel. Space 46.

Snow, T. W., Construction Company, Chicago.—Water cranes; tanks and fixtures; tower hoists; coaling spouts; bucket loaders. Represented by T. W. Snow, O. T. Snow, B. L. Snow, S. C. Crawford and W. A. Lathrop. Space 50½.

Templeton, Kenly & Co., Ltd., Chicago.—Lifting jacks. Represented by H. B. Burlow, A. C. Lewis, J. L. Crowley, P. H. McManus, Jos. Dolar, S. A. Nelson, M. J. Evans, J. J. O'Fallon, A. E. Ferguson, E. T. Schroeder, W. K. Kenly, T. L. Simpson, Wm. Simpson and A. C. Mills. Space 32.

Thompson Bros. Company, Chicago.—Danger signals. Represented by W. E. Thompson, R. A. Thompson, E. W. Johnson, W. W. Beckwith and G. F. O'Connell. Table space.

Toledo Pipe Threading Machine Company, The, Toledo, Ohio.—Pipe threading and cutting tools. Represented by D. A. Longenecker. Space 31.

Track Specialties Company, Inc., New York City.—Guard rail clamps; rail joints; guard rail braces spikes; anchor plates; derails; armored insulated track bolts; rail braces; track shims; tie plates. Represented by W. B. Lee. Space 39.

Train Control Appliance Company, El Paso, Tex.—Automatic stop. Represented by M. B. Bulla and J. P. Nash. Space 171½.

Two-Way Anchor Company, St. Paul, Minn.—Rail anchors.—Represented by E. L. Van Dresor. Table space.

U. S. Wind Engine & Pump Company, Batavia, Ill.—Water columns; water column valves; automatic control valves; pumpstands; switch stands; tank hoops and wood tank materials. Represented by L. E. Wolcott, J. P. Prindle, F. E. Pearson, C. E. Ward and T. S. Daniels. Spaces 111 and 112.

Union Switch & Signal Company, Chicago.—Signals; relays; switch circuit controllers; rail joints; clockwork time release; detector bar rail clip. Represented by W. P. Allen, C. R. Beall, G. A. Blackmore, W. H. Cadwallader, Roy Clayburn, J. P. Coleman, J. Cozzens, A. Dean, M. L. Gray, H. W. Griffin, H. R. Sheene, J. S. Hobson, L. F. Howard, L. V. Lewis, J. L. Loucks, George Marloff, W. P. Neubert, H. McCready, J. E. Saunders, W. W. Talbert, J. F. Talbert and V. K. Spicer. Spaces 66 and 67.

Verona Tool Works, Pittsburgh, Pa.—Track tools; levels; gauges; track jacks; nut locks; verona rail springs. Represented by E. Woodings, J. S. Wincrantz, A. T. Richardson, W. W. Glosser, Porter L. Laughlin, F. B. Nimmo and Wm. F. Hart. Spaces 129 and 148.

Volkhardt Company, Inc., Stapleton, S. I., N. Y.—Railroad water hydrants, etc. Represented by Wm. Volkhardt. Space 160.

Wailes Dove-Hermiston Corporation, Cleveland, Ohio.—Protective coatings for steel bridges, tanks, buildings and other structures. Represented by Irving Noonan, J. A. Graves and Wm. P. Tobin. Spaces 149 and 149½.

Warren Tool & Forge Company, The, Warren, Ohio.—Picks; adzes; track chisels; bars; punches. Represented by H. C. Mull, M. J. Konold and Geo. F. Konold. Space 222.

Waterbury Battery Company, The, New York City.—Unit cylinder cells and renewals. Represented by M. L. Martus, O. B. Frink, G. A. Nelson, G. S. Gaunt and S. J. Hough. Space 38.

Wayne Tank & Pump Company, Fort Wayne, Ind.—Portable rivet heaters; lubricating oils; storage systems; oil burning apparatus; oil filtration systems; water softeners. Represented by Fred H. McCulloch, F. J. Panot and James Stokoe. Space 144.

Werner Machine Company, West Allis, Wis.—Spike shakers. Represented by Ed J. Wind and F. A. Gardner. Space 164½.

West Disinfecting Company, Chicago.—Insector devices; insecticides; roach powders; fumigators and disinfectants. Represented by H. E. Daniels, W. L. Larry and E. C. Daniels. Space 159.

Western Electric Company, Inc., Chicago.—Electrical lighting; power devices and supplies. Represented by George Hull Porter and Otis B. Duncan. Spaces 58 and 59.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.—Portable arc welding set; industrial motors; industrial control; turbine generator set; head lighter turbine sets. Represented by G. H. Jaspert. Space 191.

Wm. Wharton Jr. & Co., Inc., Easton, Pa.—Manganese steel tipped split switches; manganese steel rail-bound and plain bolted frogs, etc. Represented by H. F. McDermott. Spaces 116, 117, 135 and 136.

Wood Shovel & Tool Company, The, Piqua, Ohio.—Shovels; scoops; machine for testing wear and strength of shovels. Represented by C. L. Butts, M. H. Lytle and J. W. Browning. Space 185.

Woods Bros. Construction Company, Lincoln, Neb.—Standard current retard method of river bank protection, using as the anchors, concrete pile hydraulically sunk below scour. Represented by Bert Faulkner, J. G. Aldrich, Wayne Pringle and S. J. Chakow. Space 224.

Woolery Machine Company, Minneapolis, Minn.—Railway motor car and engines. Represented by H. E. Woolery and C. E. Berg. Space 223.

Wyoming Shovel Works, The, Wyoming, Pa.—Track shovels; picks; scuffle hoes. Represented by H. T. Potter, G. E. Geer and S. H. Smith. Space 103.

Engineers Hear Talk on Building Failures

The failure to employ competent structural engineers in the design of the Knickerbocker theatre at Washington, D. C., and the Masonic temple at Salina, Kans., was the underlying cause of the recent collapse of these two structures. This was the conclusion reached by T. L. Condron, consulting engineer, Chicago, in a paper presented last night to an audience of 260 in the rooms of the Western Society of Engineers. Mr. Condron made careful investigations and detailed reports on each of these failures and was able to show conclusive evidence of gross incompetence in the designs of these two buildings. The roof failure at Washington, which resulted in the loss of 98 lives, was caused by glaringly inadequate structural steel framing. "The lesson in these failures," said Mr. Condron, "is that the structural design of buildings cannot be entrusted to anyone who is not qualified by training and experience to take full responsibility for it."